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VARIABLE FORMAT

TABLE OF CONTENTS

ANNA BERLINER	
The influence of mental work on the visual memory image	355-370
PHYLLIS BLANCHARD	
A psycho-analytic study of Auguste Comte	159-181
E. G. BORING and E. B. TITCHENER	
Minor studies from the psychological laboratory of Cornell University	219-232
E. G. BORING, E. B. TITCHENER and H. P. WELD	
Minor studies from the psychological laboratory of Cornell University	442-448
IVY G. CAMPBELL	
Manaism: A study in the psychology of religion	1-49
EDNA E. CASSEL and K. M. DALLENBACH	
The effect of auditory distraction upon the sensory reaction	129-143
EDNA E. CASSEL and K. M. DALLENBACH	
An objective measure of attributive clearness	204-207
JUDITH CATTELL, JOSEPHINE GLASCOCK and M. F. WASHBURN	
Experiments on a possible test of aesthetic judgment of pictures	333-336
MARGARET E. COBB, MARGARET KINCAID and M. F. WASHBURN	
Further tests of the verbal ability of poor spellers	331-332
F. CUTOLO, JR.	
A preliminary study of the psychology of heat	442-448
K. M. DALLENBACH	
Dr. Morgan on the measurement of attention	122-123
K. M. DALLENBACH and EDNA E. CASSEL	
The effect of auditory distraction upon the sensory reaction	129-143
K. M. DALLENBACH and EDNA E. CASSEL	
An objective measure of attributive clearness	204-207
J. F. DASHIELL	
Sixteen origins of the mind	435-441
CORA L. FRIEDLINE	
The discrimination of cutaneous patterns below the two-point limen	400-419
JOSEPHINE GLASCOCK, JUDITH CATTELL and M. F. WASHBURN	
Experiments on a possible test of aesthetic judgment of pictures	333-336
MABEL ENSWORTH GOUDGE	
A qualitative and quantitative study of Weber's illusion	81-119
G. STANLEY HALL	
A medium in the bud	144-158

ISABELLE JOHNSON and EDWARD CHACE TOLMAN	
A note on association-time and feeling	187-195
MARGARET KINCAID	
An analysis of the psychometric function for the two-point limen with respect to the paradoxical error	227-232
MARGARET KINCAID, MARGARET E. COBB and M. F. WASHBURN	
Further tests of the verbal ability of poor spellers	331-332
E. DE LASKI	
The psychological attitude of Charles Dickens towards surnames	337-346
M. LUCKIESH	
On "retiring" and "advancing" colors	182-186
MARGARET MONTAGUE, M. M. REYNOLDS and M. F. WASHBURN	
A further study of freshmen	327-330
CLYDE B. MOORE	
Notes on the presidents of the American Psychological Association	347-349
HENRY JONES MULFORD	
The human mind	272-290
GARRY C. MYERS	
Some variabilities and correlations in learning	316-326
MARGARET OTIS	
Aesthetic unity	291-315
STEPHEN C. PEPPER	
What is introspection?	208-213
ARTHUR S. PHELPS	
The mental duet	449-450
M. M. REYNOLDS, MARGARET MONTAGUE and M. F. WASHBURN	
A further study of freshmen	327-330
GILBERT J. RICH	
A checking table for the method of constant stimuli	120-121
CHRISTIAN A. RUCKMICH	
A bibliography of rhythm	214-218
ALBERT SCHINZ	
French origins of American transcendentalism	50-65
ALBERT SCHINZ	
Intellectualism versus intuitionism in French philosophy since the war	393-399
MAX SCHOEN	
Prolonged infancy—its causes and its significance	196-203
HENRY BRADFORD SMITH	
Aristotle's other logic	431-434
E. B. TITCHENER and E. G. BORING	
Minor studies from the psychological laboratory of Cornell University	219-232
E. B. TITCHENER and H. P. WELD	
Minor studies from the psychological laboratory of Cornell University	337-346
E. B. TITCHENER, H. P. WELD and E. G. BORING	
Minor studies from the psychological laboratory of Cornell University	442-448

CONTENTS

v

EDWARD CHACE TOLMAN and ISABELLE JOHNSON	
A note on association-time and feeling	187-195
W. D. WALLIS	
Ethical aspects of Chilkat culture	66-80
M. F. WASHBURN	
Minor studies from the psychological laboratory of Vassar College	327-336
H. P. WELD and E. B. TITCHENER	
Minor studies from the psychological laboratory of Cornell University	337-346
H. P. WELD, E. B. TITCHENER and E. G. BORING	
Minor studies from the psychological laboratory of Cornell University	442-448
WESLEY RAYMOND WELLS	
The theory of recapitulation and the religious and moral discipline of children	371-382
WESLEY RAYMOND WELLS	
The biological value of religious belief	383-392
H. D. WILLIAMS	
On the calculation of an associative limen . . .	219-226
PAUL THOMAS YOUNG	
An experimental study of mixed feelings . . .	237-271
P. T. YOUNG	
The localisation of feeling	420-430
Note— <i>American Journal of Physical Anthropology</i> . .	457
Notice to readers	128
BOOK REVIEWS	451-454
BOOK NOTES	124-128, 233-236, 350-353, 455-457

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No. 1

MANAISM: A STUDY IN THE PSYCHOLOGY OF RELIGION

By IVY G. CAMPBELL

- I. Introduction
- II. Nature of Manaism
 - a. Field-workers' reports
 - b. Interpretations of these reports
 - 1. Mana as a magical power
 - 2. Mana as an impersonal spiritual power
 - a. Individual in its source
 - b. Social in its source
 - 3. Mana as a personal spiritual power.
- III. Is Mana Impersonal?
- IV. Is Manaism prior to Animism?
- V. Application of our Theory to Representative Primitive Data
- VI. Is Manaism Religion?
- VII. Is Manaism Magic?
- VIII. Conclusions
- IX. Bibliography

I. INTRODUCTION

In recent years a theory has appeared which purports to describe man's first explanatory reaction to his environment. For many years it was supposed that animism was this first reaction; but this new theory, variously called animatism, dynamism, manaism, pre-animism, etc., states that man first

*The writer wishes to express her thanks to President G. Stanley Hall, under whom this study was made, for advice and criticism; to Professor Mary Whiton Calkins for very helpful criticisms and suggestions; and to Dr. Louis N. Wilson, Librarian of Clark University, for courtesy and kindness in making available the literature for the study.

explains things, not in analogy to his own soul as animism holds, but rather by postulating a great force such as mana.¹

The present study attempts to evaluate this claim, first by a consideration of the statements made by the upholders of the view, and second by a study of those beliefs of primitive peoples which afford the material for this contention. Not only the beliefs of primitive peoples quoted by the holders of this theory but also comparable ones from other parts of the world have been considered. The material for this second part has, for the most part, been taken from accounts of so-called primitive religions; and although to us these accounts seem to contain a mixture of philosophy, psychology, anthropology, religion, etc., they will here be largely treated from the angle of their relation to religion.

In treating the material from this standpoint four problems seem to stand out: first, what is the nature of this mana which has been so prominent in primitive beliefs; second, is it true that manaism represents an explanatory reaction prior to animism—and if not, what is the relation of the two concepts; third, is manaism religion; fourth, is it magic. As the discussion centering around the theory of manaism is one of such comparatively recent date, we have reviewed at some length both the material on which the theory has been based and the interpretations which various writers have made of this material. The reader is thus enabled to judge of the worth of the theories and of the justification of our criticisms. In presenting the compilation of material which we have gathered from reports of primitive peoples selection has been made of that gathered from parts of the world which have not previously found a large place in the literature of pre-animistic discussions. Since the data from North America and Australia have been previously extensively cited, this study, in order to uphold its contentions, stresses the data of Africa and Australasia, exclusive of Australia.

As is necessary in dealing with such large areas, the collection of material used is limited. Selection of reports by the most reliable workers has been made and preference has been given to those writers who have spent many years among the people whom they report. Material reported in the last fifteen years has been most often used because earlier reports

¹ Mana is a Melanesian term, generally interpreted to mean impersonal power—a term representative of the concepts on which 'pre-animism' is based. It is similar to such terms as Wakanda, orenda, kici, etc. We have used the term manaism to express the beliefs in regard to mana and similar terms.

are current in the literature of pre-animism and also because it seems to us that this later literature shows more of a tendency to report what the native actually states than to report interpretations of these statements. In the space of this article, the wealth of material on the subject can only be indicated, but if we have given enough to point out the seeming inconsistencies in the various reports and to indicate wherein the points of disagreement lie—it should be of value. Whether or not our interpretation of the material gathered, proves, in the light of later investigations, to be acceptable and true, it is hoped that it has at least added something to the discussion.

II. NATURE OF MANAISM

We shall first give quotations from writers who in person have spent time among the primitive people whom they report. The authors state in these quotations what they think the primitive believes. These quotations are representative of the material on which writers have based a theory of pre-animism. We shall then give the various interpretations that have been made in regard to these beliefs. For the sake of convenience we shall call the first quotations, field-workers' reports and the discussions made upon the basis of these, interpretations. We realize that in the field-workers' reports there may be some interpretation.

a. Field-workers' Reports.

Dorsey (16:365) writes:—

"It has been asserted for several hundred years that the North American Indian was a believer in one Great Spirit." Very often Wakanda has been taken to mean a Supreme Being "but in the *Čegiha*, the language spoken by the Ponka and Omaha, Wakanda means "mysterious," or "powerful one." . . . Some of the old people say that their ancestors always believed in a supreme Wakanda or Mysterious Power."

Miss Fletcher (20:326-327) says concerning the Indian's belief in the nature of life:—

"The belief . . . involved two prominent ideas; first, that all things animate and inanimate were permeated by a common life; and second, that this life could not be broken but was continuous. . . . This power which brings things to pass is *Wakon'da*. The question arises did the Omaha regard *Wakon'da* as a Supreme Being? There is no evidence that he did so. . . . The word *Wakon'da* seems to express the Indian's idea of immanent life manifest in all things."

Mcgee (55:182) after enumerating many things that are called wakanda writes:—

"Thus the term is applied to all sorts of entities and ideas and was used indiscriminately as substantive and adjective, and with slight modification as verb and adverb . . . the idea expressed is indefinite, and cannot justly be rendered into 'spirit' much less into 'Great Spirit,' though it is easy to understand how the superficial inquirer . . . came to adopt and perpetuate the erroneous interpretation. The term may be translated into 'mystery' perhaps more satisfactorily than into any other single English word, yet this rendering is at the same time much too limited and much too definite. As used by the Siouan-Indian, wakanda vaguely connotes also 'power,' 'sacred,' 'ancient,' 'grandeur,' 'animate,' 'immortal,' and other words, yet does not express with any degree of fulness and clearness the ideas conveyed by these terms singly or collectively."

Major Powell in an introduction to Mr. Cushing's 'Zuni Folk Tales' (11:X-XI) writes:—

"In every language there is a term that expresses this magical power. Among the Iroquoian tribes it is called orenda; among the Siouan tribe some manifestations of it are called pokunt. Let us borrow one of these terms and call it 'orenda.' All unexplained phenomena are attributed to orenda."

Hewitt (33:33-36) in speaking of orenda writes:—

" . . . primeval man made the further assumption that in every body of his self-centred cosmos inheres immanently a mystic potency of diverse efficiency and purpose. . . . This hypothetic magic potency is, then, held to be the property of all things, of all bodies, and . . . is regarded as the efficient cause of all phenomena, all the activities of his environment."

Jones (41:183) tells us that the Algonkin Manitou is a solemn religious word:—

"It is a property which is felt to be everywhere—it enters into everything in nature, it is active and assumes various forms according to the individual. . . . The Algonkin peoples his world with manitou forces different in degree and kind. . . . Each object and being has the investment of a common, mystic, virtue which gives them all a common name, and that name is manitou . . . but wherein one differs from the other is in the nature of its function, and in the degree of possession of the cosmic substance."

In these quotations we see that first-hand reports of Indian thought show us a belief in a pervasive all-powerful force in the universe, a force which is present in varying degrees in all things. A belief in a similar great force was reported to exist among the Melanesians by Codrington (8:118-119):—

"The Melanesian mind is entirely possessed by a belief in a supernatural power or influence called almost universally, mana. This is what works to effect anything which is beyond the ordinary power of men, outside the common processes of nature, attaches itself to persons and to things and is manifested by results which can only be ascribed to its operation. . . . There is a belief in a force altogether distinct from physical power, which acts in all kinds of ways for good and evil, and which it is the greatest advantage to possess or control."

This is Mana. The word is common I believe to the whole Pacific. . . . It is a power or influence, not physical, and in a way supernatural, but it shows itself in physical force, or in any kind of power or excellence which a man possesses. This mana is not fixed in anything; but spirits, whether disembodied souls or supernatural beings, have it and can impart it; and it essentially belongs to personal beings to originate it, though it may act through the medium of water, or a stone or a bone."

b. Interpretations of these Reports

Students of Manaism have taken their clue from the reports from which these quotations have been given and have looked for evidences of such beliefs elsewhere. They have interpreted mana in a number of ways which may be roughly grouped under four headings: first, those who regard mana as a magical, impersonal force, the idea of which is obtained from observations of unusual natural phenomena; second, those who regard mana as a spiritual power, the conception of which arises from an unusual mental experience of an individual, such an experience as a great willing or emotional excitement; third, those who state that mana is an impersonal power, the consciousness of which comes through social activity experiences; fourth, those who regard mana as a personal spiritual power experienced while in social activities.

1. Impersonal, from the unusual.

J. King (44), who so far as we have been able to find was the first writer to bring together a number of different concepts of a great force such as mana, wakanda, boyla, states that man's first idea of force was not gained from personal beings but from physical force. This idea arose when something was incomprehensible to man. So long as things go smoothly man pays no attention to them, but let something baffle him and then due "to his very organic sensibilities" he will evolve the supernatural. Irving King (45) holds a somewhat similar view, in saying that those things which demand a "watch-out attitude" from man made him regard them as containing an unusual force. Preuss (61) states that the quality of *Verwandlungs-fähigkeit* in things gives rise to the idea of great force, mana. Hartland (30:679) states that there are certain characteristics of objects which make them appear very mysterious and that accordingly they are thought to have a "potentiality which is exactly expressed by the word, orenda." Schmidt (65) believes that mana is the power conceived through experiences with those things which will not fit into the normal or profane idea of causality. For Leuba (52) mana is an impersonal power, the concept of which arises from man's noticing the phenomenon of causal-

ity. To see how early man arrived at his idea of impersonal force Leuba goes to the child to see in what way *he* arrives at the concept. He finds that very early the child asks the question "What makes this go?" and observing this Leuba states (p. 78) "already he is in possession of the abstract idea of cause and effect." Leuba goes on to state that he believes that the idea of power implied in cause is that of an impersonal power and is in the child's possession before he is three years of age. In the same way primitive man arrives at an idea of impersonal power.

2. Mana as power, conceived from unusual mental experiences of the individual.

Brinton (3:47-60) interprets Wakanda as follows:

"The Wakan of the Dakota Indians is the deification of that peculiar quality or power which man is conscious of within himself as willing or directing a course to bring about certain results. . . . The universal postulate, the psychic origin of all religious thought, is the recognition or if you please, the assumption, that conscious volition is the ultimate source of all Force. It is the belief that behind the sensuous, phenomenal world, distinct from it, giving it form, existence, and activity lies the ultimate, invisible, immeasurable power of Mind, of conscious Will, of Intelligence, analogous in some way to our own and that man is in communication with it."

Moreover Brinton makes, what in the light of later discussions, we regard as a very significant statement, i.e., that this "Will-Power" is "posited" in moments of great excitement, "rapture, intoxication or frenzy."

Miss Fletcher has spent a great deal of time ascertaining the meaning of Wakanda. Of this common force running through all things she writes (19:598-600):

"While the conception of Wako'n'da may appear somewhat vague, certain anthropomorphic attributes were ascribed to it, approximating to a sort of personality. . . . All experiences in life were believed to be directed by Wako'n'da. . . . An old Indian explained 'All forms mark where Wako'n'da has stopped and brought them into existence.' The belief that the power of Wako'n'da is akin to the directive force of what man is conscious within himself, is implied in the old man's remark: each 'form' was the result of a 'stop' where there had been a distinct exercise of the will power, an act of the creative force of Wako'n'da performed."

Again she writes:²

"In this conception man views all things from his own personality and from this standpoint predicates his relationship to animate and inanimate nature. Conscious within himself of an ability to move and to bring to pass, he regards motion, whether of body or of mind, as a universal ability and as the simplest and most fundamental mani-

² *Amer. Anthropologist*, N. S. Vol. 14, 1912, p. 38.

festation of a mysterious indwelling power that has brought all things into existence and is the cause of all movement."

Again of Wakonda she says (20:327):

"All things were distinct from man but in the subtle bond of a common life, embodying the idea of will or directive energy, they were akin to him and could lend him the aid of their special powers, even as he could help or hinder his fellowman."

Marett's view seems to be a combination of these first two explanations of mana. For him mana is the power which is thought to be in objects which excite awe. He writes (54:10):

"In response to, or at any rate in connection with, the emotions of awe, wonder, and the like, wherein feeling would seem for the time being to have outstripped the power of 'natural,' that is, reasonable, explanation, there arises in the region of human thought a powerful impulse to objectify and even personify the mysterious or 'supernatural' something felt."

This attitude of the mind, dictated by awe of the mysterious, Marett calls Supernaturalism. The objects which give rise to awe and are thus thought to have this extraordinary power are of many kinds; spirits, startling manifestations of nature, curious stones, animals, human remains, some diseases, blood, etc. One important source of awe that Marett especially stresses is that of magical acts. The heart of the magical affair he states is in the "spell" which in turn really reduces to an extraordinary exertion of will which is supposed to make the desired event take place. It is mana which accomplishes this end, mana—which "on its inner side is just this seemingly mysterious power of putting the magical act through, of willing semblance into reality." "The true source of mana immanent in the spell is the operator's exertion of will power." (p. 56.) Once the magician has gained the idea of this power through his own projective acts of will he will attribute the same power to all manifestations of the supernatural which appear to have great power. Thus we see that the idea of mana, great power, may arise from observations of unusual natural events or from unusual psychic events.

3. Power—conceived through social activities.

The third explanation of the genesis of the idea of mana is that the idea arises in social activities—when a great power is experienced.

Hubert and Mauss (37) in a very elaborate study of magic point out that the belief in a great impersonal force is the basis of all magical practises. The conception of such a force arises because the group acting together, as it does in magical practises, is very emotionally stirred and accomplishes things

it does not at other times. At such times the magician accomplishes wonderful feats and this suggests to the excited onlookers as well as to the magician himself that there is a great power at work. Without such a power magical acts could not be accomplished. In fact mana, the great power, is a "collective category"—a belief held to by a group of people.

Levy-Bruhl (50) in attempting to explain such beliefs as mana, states that primitive man's mentality must be explained by "collective representations," according to which all objects contain a mystic power. These "collective representations" are social achievements and are results of states of consciousness that contain much more of the affective and motor side of consciousness than of the intellectual. They are impressed upon the individual very often at times of social activity, and for this reason seem to have a great power back of them. Thus for Levy-Bruhl it seems to be the effect of the social experience upon the individual that gives rise to the idea of mana.

Miss Harrison, who from her extended studies upon ancient Greek religion comes to the conclusion that it is a great force which is at the bottom of the whole Greek religion, believes this great force to have been conceived from social activities. She writes (29:65):

"In all excited states whatever be the stimulant . . . man is conscious of a potency beyond himself, yet within himself, he feels himself possessed, not by a personal god . . . but by an exalted power. The power within him he does not, cannot, at first clearly distinguish from the power without, and the fusion and confusion is naturally helped when the emotion is felt collectively by the group. This fusion of internal will and energy with external power, is of the very essence of the notion of sanctity."

Cornford (9) agrees with Miss Harrison in her interpretation of Greek religion and believes that he finds traces of this same social force, mana, in early Greek philosophy. Cornford contends that at first primitive man did not attempt to *represent* the power felt in his group activities—he merely felt and lived it. Collective emotion, desire and action were all that existed in this early time. However when man contrasted his own power with that of this collective power he then attempted to represent the power felt. Mana represents the kinship of the group. But kinship in early society meant merely the *functions* of the group, what the group felt and did. The behavior of the group was its essence. Primitive man necessarily represented this kinship under some material form—which form Cornford finds to be blood.

Durkheim (17) in an intensive study of the natives of

Australia finds that they have a concept of a great force similar to mana, which is especially noticeable in their system of totemism. This great power pervades all things related to the totem—the totem, the totemic representations, the totemic species and the members of the totemic clan. The concept of this great force is due to the form of society found in Australia. The Australian passes through two phases of life, that of every-day occurrences and that of times of social meetings, *corroborrees*, when dances, etc., take place. At these latter times man is very much excited, is taken outside of himself, feels that he is entered by an outside force, finds himself able to do things that he could never do before. Feeling this power to be entering him from the outside he looks around for its source and his attention centres upon the most prominent thing in his environment, which in this case is the many representations of the totem which are present as marks on his instruments, bodies, etc. These are regarded as the source of this power and gradually this power comes to be attributed to all things connected with the totem. Durkheim believes the contrast which man must make between the times of social activities and those of daily commonplace life gives the empirical foundation for the basal characteristic of all religions, namely, the division of things into sacred and profane. We omit at this point our criticism of Durkheim's contention, that since Australian society is based upon the most primitive form of society known, i.e., the clan, and that since totemism is the religion based upon this clan system it must hence be the most primitive form of religion, since the point has been very ably raised in an article by Goldensweiser.³

4. Mana, a personal, spiritual power—conceived through social activities.

From our own study of such concepts as mana, wakanda, etc., we believe that among the peoples who hold this belief mana is thought to be a great personal spiritual power and that it is a concept which is gained through great social activity. We cannot accept mana as an impersonal force for reasons set forth in the next section. As to this force being spiritual nearly all field-workers do so call it, e.g., Fletcher, Powell, McGee, Codrington, Tregear, Junod, Dennett, Warneck, Neuhaus—and in the light of the use made of this concept by primitives we cannot see how else it could be interpreted. As an example of this use let us look at reports from Melanesia.

Codrington (8:119 seq.) reports that mana has three sources

³ *The Journal of Philosophy, Psychology and Scientific Methods*, Vol. 14, No. 5, March 1, 1917, pp. 113-123.

—a spirit, a dead man's ghost, a living man. If a man has mana it resides in his spiritual part. Moreover you cannot say that a man is mana only that he *has* mana. After a man's death his soul becomes a ghost but only if during life he has had mana does his soul become a tindalo, "a ghost of worship." Marett (54:118) points out that mana comes very near meaning soul or spirit and turns to Tregear's dictionary to uphold this statement. "Mana from meaning indwelling power naturally passes into the sense of "intelligence," "energy of character," "spirit;" and the kindred term *manawa* (manava) expresses "heart," "interior man," "conscience," "soul;" whilst various other compounds of mana between them yield a most complete psychological vocabulary—words for thought, memory, belief, approval, affection, desire and so forth."

Such statements are widespread as we shall see when we take up this concept among the primitives themselves and cannot but convince one that by mana the primitive does mean some sort of a spiritual power. But even if the primitive did not explicitly state that he does mean spiritual power—how else can power be conceived? As Hume long ago pointed out we cannot gain an idea of power from the mere observation of external events. Such an idea must come from within our own consciousness. On this point we will quote Miss Calkin's admirable summary of the subject (5:457-458):

"Energy is generally defined as capacity for work. Narrowly scrutinized, this statement means simply that energy is conceived as the further undefined cause of phenomena; and energy is thus reduced to a relation, causality, already claimed by the idealist as ideal. Many of those who conceive of reality as energy, seem, however, to mean by energy force. But force is defined in one of three ways: either as resistance, a quality directly revealed through muscular sensation; or as a cause of motion; or as no more or less than a mathematical ratio, a measure of motion—the force of B on A being defined as 'the product of the mass of A into the acceleration of A due to the presence of B.' But each of these is a conception of the ideal, not of non-ideal reality. A mathematical relation is a mental conception; the resistance or stress which (to quote Montague) is immediately felt when a man places 'his hand between a fixed spring and a body moving uniformly into collision with it,' is a sensible quality; and motion, . . . is made up of spatial and of temporal relation. . . . You can give no unchallenged account of these qualities and relations, except as distinctive ways of experiencing, that is, of being conscious."

As to the genesis of this idea of power we agree with those writers who contend that this is given rise to by social activities. During such experiences, more than in any others, man feels himself a much greater being than he has ever felt before. He accomplishes things that he could not accomplish

before, and acting in common with others he feels himself a power never felt before. Social activity is the adequate stimulus which sets off a specific response, namely, feeling the self as a greater power than it has ever felt before.

Such an interpretation of the facts does not demand a certain sort of society to give rise to this experience of expanded greater self, but any activity involving a larger number of persons than the individual is accustomed to acting with will furnish the adequate stimulus. Such group activities are universal. Then when once this power has been experienced within the self, it can then be projected and used to explain anything that seems great. This is why we so often in primitive studies meet with the statement that mana is the power which is found in the extraordinary. Mana is the extraordinary self power felt when in the social activity and when once this power has been experienced, objects performing extraordinary feats are then explained as acting by means of this great power.

And to say that the social does play a very large part in the affairs of primitive people is not biasing the facts. So large a rôle does the social play with these people that many writers have been tempted to omit the equally prominent individualism, displayed in primitive society. Although it is a fact that the most important occasions of a man's life seem to be those of social importance, nevertheless at such times he is still regarded as an individual. Take the widespread initiation ceremonies where elaborate ceremonies are performed in order to initiate the boy into the tribe. Places sacred to this ceremony are often found, instruments used only at these times are stored away in sacred places, certain men devote their time to preparation for these festivals. Such a ceremony may last for ten days, during which time all other activities are suspended. Such time and energy devoted to the task of making a boy become a member of the tribe cannot but impress him with the power of society. And especially as these ceremonies make such an appeal to the emotional and active motor life, we cannot be surprised that the primitive holds that the society has in it some remarkable, wonderful, power, not generally experienced elsewhere. In Polynesia and Melanesia, it is pointed out by Hubert and Mauss, that the success of the chase, fishing, war, is believed to depend upon the social solidarity maintained during this time. Crimes against society which at other times go unpunished, are at these times punished by death. These same writers speak of an ancient Madagascar text which tells how when the men

~~are away it was~~ the women stay up all night, keeping up the fire, ~~singing and~~ chanting all night. The Dyak and New Guinea ~~women do~~ the same, in their chants calling for power for their absent warriors.

Among primitive peoples collective willing is very common. Take for instance the rite of Wa-zhin'-dhe-dhe among the Sioux Indians, as reported by Miss Fletcher (22). This was a rite, where through the singing of songs strength could be sent to an absent warrior in the stress of battle. The Omaha women gathered at the tent of an absent warrior and sang the songs. The songs were the medium by which the strength was conveyed to the man facing danger. Another Siouian ceremony, showing the belief in the power of collective willing, is that of Wa-zhin'-a-gdhe. This was a rite peculiar to the Han-he-wa-chi, a society of men, each of whom had done one hundreds or more deeds called Wa-dhin'-e-dhe, deeds which could be accomplished only were supernatural power granted to them. These men met together and by means of collectively exerting their will-power and by singing certain songs peculiar to this society, they willed that the full consequences of a certain line of conduct would fall upon a person who of his own accord had determined upon this line of conduct. This act left the victim isolated from all helpful relations with men and animals.

A somewhat similar idea is shown among the Kenyan people of Borneo (36: vol. I. 121). During a ceremony known as soul-catching, in which a professional soul-catcher sends his soul after the soul of the man who is ill, the soul-catcher (Dayong) struts back and forth chanting a form of words well known to the people, who are sitting around in a circle and who come in on a sort of a chorus saying, "Bali-Dayong," meaning "Oh powerful Dayong." In fact in all magical practises among these people the men and women sit around a central figure and join in the "Bali-Dayong." By the work of group volition they hope to effect their end.

Hodson⁴ gives us an interesting example of the force of collective willing. The Manipur tribes hold *gennas* (times when all the members come together and perform certain rituals). A sacrifice is always made at these *gennas*. This is led by the *khullakpa*, the village priest, who "acts whenever a rite is performed which requires the whole force of the community behind it, and this force finds its operation through him. These village *gennas* seem in many cases to be inspired by the belief that man, *the man*, the khullapa, when fortified by the whole

⁴ Hodson, T. C., *The Naga Tribes of Manipur*. London, 1911, p. 141.

strength and will of the village, is able to control and constrain forces which are beyond his control if unaided."

Marett (54:119) gives us an example of the belief in the power of individual willing in the case of the native of the Solomon Islands who sent him the words of a *mana* song but who said that with it Marett could not perform miracles. In order to do this he must send the native money and then "ipso facto he will transmit the mana to you—as we should say, the 'good-will' of the concern."

The prominence of Totemism as a primitive belief shows the important rôle of the social. Totemism is a bond which holds all of the members of a group together. All of this group must act together, must obey the same customs, respect the same powers, etc. Durkheim has proved, it seems to us, that the thing revered, feared or what not, in totemism is the power behind all the badges, members, etc., connected with a certain totem. This power he has shown to be the power felt by the members of a certain group when they are acting together. Miss Fletcher speaks of totemism in the following way (20:331):

"From the study of minutiae of the customs and ceremonies within the gens, it is apparent that the underlying purpose was to impress upon the people the knowledge and the duties of kindred, and that one of the most important of these duties was the maintenance of the union of the gens. This union of kindred we find to have been guarded by the agency of the totem."

Magical practices are extremely widespread among primitive people and these practices, if we accept Hubert and Mauss' careful and elaborate study, are based upon the prominence of the power which primitives attribute to the social.

All workers among primitive peoples are impressed by the rôle which social ceremonies play among these peoples. A statement by Haddon (28:51-52) shows this very admirably.

"It is difficult for us to realize that awe and reverence that was felt by these people for these social ceremonies and it must be admitted that this intense feeling combined as it was with reticence and discipline had a strong educative effect upon the people. For this reason, if for no other, these ceremonies are worthy of a very careful study. Whatever tends to take a man outside of himself and to weld him into a solidarity, limited though this may be, is an upward step in the slow and laborious evolution of man, and deserves our sympathetic respect. The paraphernalia of nearly every ceremony of all peoples are generally foolish, and often grotesque, to the outsider; but they awaken deep religious sentiment in the true believer. . . . There cannot be the least doubt that these sentiments exist among so-called savages and those who scoff at their ceremonies thereby condemn themselves."

Many persons will grant the prominent rôle of the social among primitive peoples and yet will not perhaps grant that it holds such an important place as does the concept of mana, which, as Codrington points out, is the power that all Melanesian religion and magic is attempting to obtain and which Hubert and Mauss contend all magic is striving for. It may be objected to our thesis (that mana is the power felt during social activity) that though men may act together in order to obtain mana—this does not make mana the power felt at such times. But from what other source can the idea of mana power come? We believe that it must be based upon some empirical experience. Man knows power only when he experiences power and where is the experience that will give him the idea of this great power? Surely we will all grant that during social excitement, especially when we are taking part in the social activities, great power is experienced. And since in primitive society nearly always the important occasions are social ones, we should expect this social power to play a large rôle. The primitive magician must have a sympathizing audience in order to work himself up to the state where he can accomplish great feats. And it is interesting to note that very often it is stated that the magician is the member of the tribe who has the greatest amount of mana. And again as Codrington points out, the position of a man in society is determined by the amount of mana which he possesses. And, as is shown by the common custom of the group getting together and by chanting attempting to send the power of the group volition to an absent one—we see that the primitive realized the power of concerted effort. From the very instinct of gregariousness man was bound to find out that acting together gave more power—especially would this be true in primitive society, where due to the relative simplicity of the life, the members of the tribe came together more often in tribal ceremonies. The almost universal ceremony of initiation indicates the prevalence of ceremonies which we believe could not but give rise to the consciousness of great power. Psychologically speaking, what this power is, is hard to say. It may be due to some physiological basis, such as Cannon has shown to be present in certain emotions. In the same way that the emotion of fear has often been correlated with the instinct of flight, we should be inclined to state that in this power felt during social activity is found the psychic correlate of gregariousness. This consciousness would undergo all degrees of intensity, which when it had reached a very strong intensity and was fused with the consciousness of

strenuous willing and acting would be called mana. We realize that careful introspective evidence is needed before such a suggestion could be finally held—but from our study of this concept among primitive peoples we cannot but believe that a careful analysis would yield a state of affairs somewhat as we indicate.

In such careful regional studies as those of Durkheim, Miss Harrison, Cornford, we believe that mana has been shown to be social and here we can but refer the reader to the studies by these writers if he wishes further proof of this contention. We may briefly indicate how Miss Harrison works out this idea in the Greek religion. It has generally been supposed that such a religion as that of the Greek Olympians represents a gradual personification of nature forces but Miss Harrison shows that even Zeus is merely a "projection of group-consciousness." This thesis Miss Harrison defends on the basis of an analysis of a recent archeological fragment excavated at Pahaistro. On this fragment is found a "Hymn of the Kouretes," a description of the older cult of Zeus which had its seat at Mt. Dikte and not on Mt. Ida. In this hymn we find Zeus addressed as the "Greatest of Youths" and he is called upon to come at the head of his Daimones, a fact that shows Zeus was once regarded as the "functionary" of a group. By "functionary" Miss Harrison means a personification of the power felt in group activities. Moreover in this hymn we find a description of Zeus undergoing the same sort of ceremonies that an initiate into primitive societies must to-day undergo. He is supposed to die and then be brought back to life. This seems to be an expression of the idea apparently almost universal, that in order for a youth to be a complete or worthwhile individual he must become a member of society, must experience social consciousness. This idea of the new birth among the Greek cults is, Miss Harrison believes, merely an expression of this idea of tribal initiation and not the revival of Spring, as has so often been held. Of this initiation Miss Harrison writes (29:19):

"Till the boy has died and come to life again, till he has utterly put away childish things he cannot become a full member of the tribe, he may not know the tribal secrets or dance the tribal dances . . . he cannot perform any of the functions of a full-grown man . . . at and through his initiation the boy is brought into close communion with his tribal ancestors he becomes socialized, part of the body politic. Henceforth he belongs to something bigger, more potent, more lasting, than his own individual existence; he is part of the stream of totemic life, one with the generations before and yet to come."

We believe then, that the consciousness experienced during social activity is the only one that could give rise to the concept of a great power such as mana. Such a power once experienced is afterward used as an explanatory concept which is applied to all things that seem extraordinary, all things that arouse awe or wonder or fear in man. These emotions in themselves will not give one the idea of power. Goldenweiser⁵ criticizes Durkheim's statement that the primitive contrasts the feeling of the social self with that of the everyday self, and appealing to similar situations in modern man states that the individual *identifies* rather than contrasts himself with the social.

"The individual identifies himself with the group, with the crowd; he represents himself as sharing in the power which is of the crowd, of the group. *We* thought, *we* felt, *we* did, is for him descriptive also of his own part in the proceedings. Social settings of this variety are so constant, so common an experience in the life of man, . . . that the average . . . individual never thinks of contrasting these experiences with others, or of regarding his crowd or group self as transcending the self of his daily routine. On the contrary, the crowd or group self is the self *par excellence*, as well as the self at its best."

This quotation is a little hard to understand. If, as it seems to admit, the self is regarded as at its best when in society, then this is all that is needed for Durkheim's theory. Goldenweiser goes on to point out that what is common in a group experience is the crowd psychology, not a specific emotion aroused. The emotion varies with the different crowd psychological situations. A crowd psychology situation may transform but never create a religious thrill. Now our contention has been that there is a specific state of consciousness experienced when in group activity. Doubtless, as Goldenweiser states, we may experience joy when in a crowd and it still remains joy—we may experience hatred and have it remain hatred—but if consciousness of group-self comes it is different from these specific emotions—it is consciousness of heightened activity—heightened power—of self *par excellence*, as Goldenweiser states. It is this power that is realized to be a contrast to that of everyday, individual action. As the primitive so often says, it is the extraordinary self that has mana just as it is the extraordinary external event that is due to mana.

III. IS MANA IMPERSONAL?

Most writers in describing mana have called it impersonal and since we have called it personal we are bound to consider

⁵ *Loc. cit.*, p. 122.

what is meant by these terms personal and impersonal. In the discussion in regard to mana we believe that the term impersonal has been used in one of three ways; as equivalent to (1) mechanical, (2) non-bodily, (3) super-individual.

Such writers as Schmidt, J. King, and Leuba who hold that mana is a force distinct from spiritual power or force use the term impersonal correctly we believe—but do not prove by appeal to the facts that it applies to mana. As we have stated before nearly all of the field-workers report mana as spiritual. But even if we did not have explicit statements that mana is spiritual, in what other way can force or power be conceived? As we have pointed out before force can not be other than ideal. Marett in a way seems to make mana mechanical force when he points out instances of external events giving rise to the idea of power. Goldenweiser⁶ also contends that "mana requires nothing but nature, acting, and man's mind, acted upon." Mana is⁷ "impersonal magic potency . . . to which, on the subjective side, corresponds the religious thrill." Again⁸ "manifestations of the powers of nature always did, as they still do, impress themselves on the mind of man and arouse in him that thrill or recoil which constitutes the emotional nucleus of religion."

One cannot deny that great events in nature impress man—that the emotions of awe, wonder, fear, etc. are aroused by these happenings—but to react with a certain emotion in the face of a certain stimulus is not to be religious as we shall contend in a later section. An active relationship must be assumed before we have religion proper. Moreover to jump from the passivity of an emotion to the activity of the cause of an emotion seems unjustified to us. Mana is an explanatory principle. "It is or has Wakanda" is said of the extraordinary man or event. It is not the fear that the lightning causes in us that makes us say that it is powerful—it is what the lightning does. What it does is perfectly evident the first time that we encounter it—but why, by what means it does this—requires an explanatory principle. This we have in mana. Lightning can blast a huge tree because it has *power*—it has that same force which we sometimes experience when we have the consciousness that we can do great things. Such a consciousness must be aroused by some adequate stimulus—and this we believe to be found in a group activity.

Most reporters and interpreters of mana *admit* that mana

⁶ *Loc. cit.*, p. 120.

⁷ *Loc. cit.*, p. 113.

⁸ *Loc. cit.*, p. 116.

is spiritual or quasi-spiritual force and yet state that it is impersonal, by this meaning either that it does not belong to one concrete individual human body or else that belonging to all members of the group it cannot be personal.

Hubert and Mauss (37:105) speak of *mana* as spiritual power and yet call it impersonal. They grant however that this impersonal power tends to become represented by means of "Demons"—for man seems to judge it a more concrete representation of power when placed in a personal being. They contend, however, that the idea of a spiritual person represents very poorly the general anonymous force which gives efficacy to the magician, words, gestures, power of regard, intention, etc. These writers state that "the representations of magic are personal or impersonal according to whether or not the idea of individual beings is present." From such statements it certainly is suggested that a *body* must be present in order that the word personal be used. Of course if they simply mean by individual, the consciousness of self, then we cannot see why power based upon an experience of self should not be called personal. Of course this may be a matter of different usage of terms but if so it is a usage that has caused a great deal of confusion. It seems to us that the word personal may be used of all spiritual experiences while impersonal refers to what is generally classified as mechanical. Some writers would probably wish to retain the word personal to apply to body. But why should personal designate the body? By personal one generally means all that belongs to a concept of a self. Self very often means to a person the mass of feelings, willings, etc., that he experiences, without any conscious reference to body. Now if attention has centred upon this direct experiencing of feeling or willing, and in the future, things are interpreted in the light of the power felt during this experience, why call it impersonal?

Workers among primitive peoples show very clearly that what a primitive stresses in a thing is not its external bodily form, but rather it is the power that is thought to be in this thing. Much "pre-logical" thinking has been attributed to the primitive on the ground that he seems to disregard the law of contradiction. For instance it is stated that the primitive believes that a man can be both himself and a totem animal at the same time. But what is thought to be the same is not the external form but rather the power that is shared by both. Levy-Bruhl expresses it in this way, "d'uns sorte de symbiose par identité d' essence." Radin (62:351-352) in arguing that the Indian belief is in spirits rather than in the

supposed all-pervasive force says that a confusion has arisen from not observing what the Indian believes in regard to spirits. Because spirits are not observed to have individual shapes, reporters assume that an impersonal non-individualized force is intended. But

"we are apt to make an unjustifiable assumption. Our ordinary division into personal and impersonal is made on the possession of corporeal characteristics, which are in turn dependent upon our sense-perception, sight, hearing, touch, etc. Ordinarily too the presence or absence of corporeality is the test of its reality or un-reality. What right have we to assume that the Indian makes the same classification and equates reality, with existence? To judge from specific inquiries made among the Winnebago and Ojibwa and from much of our data in general, reality does not depend necessarily upon sense impressions. . . . It is I believe, a fact that future investigations will thoroughly confirm that the Indian does not make the separation into personal as contrasted with impersonal, corporeal with impersonal in our sense at all. What he seems to be interested in is the question of existence, or reality, and everything that is perceived by the sense, thought of, felt and dreamt of exists. It follows, consequently, that most of the problems connected with the nature of spirit as personal or impersonal do not exist. . . . Whatever is the object of his thought and feelings exists."

We have given this quotation at some length as it represents the view of a first hand observer of these peoples. Radin points out that it does not follow from the fact that the primitive does not conceive of mana as invested in a certain shape or body, that he therefore necessarily conceives of it as impersonal.

Jones (41:185) brings out the same point in dealing with the custom of the sweat-lodge among the Algonkins. In this custom the manitou which is supposed to reside in a stone comes out of its abode and enters a man. The manitou in the stone is supposed to be "an objective presence; it rests on the sense of an existing reality with the quality of self-dependence; it rests on the perception of a definite, localized personality. Yet at the same time there is the feeling that the apprehended reality is without form and without feature."

Another reason that these writers give for calling mana impersonal is that it is super-individual. Mana for Miss Harrison, Durkheim, Hubert and Mauss, Cornford, is that power experienced in the part of an individual's consciousness which they call collective. When man takes part in social activities he has a very different consciousness than when he acts in isolation, and since his consciousness is shared by all, it is, these writers contend, not personal.

Cornford (9:81) speaks of it in this way,

"Outside of each individual private world of inner and outer experience, i.e., of inner and outer sensations and movements directly connected with the states of the organism there is what we have called the collective consciousness of the group as a whole. This consciousness, unlike the individual consciousness, is the same in all, consisting in those infectious or epidemic states of feeling . . . which at times when the common functions are being experienced invade the whole field of mentality and submerge the individual areas."

Cornford finds that it is this collective consciousness which is read out into any specific field of nature and forms the "daemons" of Greek religion—a thesis which Miss Harrison also defends. These "daemons" are not specific concrete individuals but merely "functions," the "group-behaviors." It is for this reason, Cornford states (9-97), "that daemons in Greek theology, as elsewhere, remain impersonal: they consist of will and force without individuality, because they are each the soul; not of an individual but of a species or kind to which they are related exactly as a 'daemon' of the human kindred is related to the group." Miss Harrison extends this idea of the content of an object being merely its "functions" to the Olympian gods, stating that at first these gods were merely a projection of the consciousness felt during group activity. Later when the group had a leader we see such individual gods as those of the traditional Olympians. In the festival of the Oschophoria Miss Harrison (29:325) points out, "the very act of transition from the periodic festival with its Eniautos-daemon to the cult of the individual hero; from, in a word, the functionary to the personality."

On psychological grounds it is a little hard to understand just what is meant by this distinction of personal and impersonal. If it is mental experiences that make up the consciousness of self why is it that certain ones of these should be called personal while others are called impersonal. Doubtless in a group activity when all the members are filled with similar states of consciousness we have what may be called a collective consciousness, but surely this is for each member merely the emotion or what not that *he* is feeling. The power experienced at this time may perhaps be thought to come partly from the outside but all the time it is felt as the self experiencing it. Because this consciousness is *stimulated* by the group action is not sufficient reason to call it impersonal. This consciousness is doubtless of a very different quality from that experienced when the individual is in isolation but at both times it is certain mental complexes that are being experienced by the same individual. Durkheim says that our soul is made up of two factors—social consciousness incar-

nated in each individual and the bodily factor. But we believe that the consciousness of the self is made up of the two factors mentioned above, i.e., the consciousness felt while acting in isolation and that felt while acting with society. We shall consider this point at more length in the next section.

If mana then is spiritual power what is its relation to the soul as this has been conceived? We have stated that mana for us is merely a certain self power experienced under specific conditions. It would be very valuable if we could state in just what the consciousness of this power consisted, but such a statement would be worthless without careful introspective analyses of such states of consciousness. But though we cannot now state what the *content* of such a state of consciousness is, it is at least valuable, we hope, to point out that such a state exists and to express the belief that some day such states will be subjected to careful introspective analysis. We can only indicate now that we are inclined to think that into this consciousness of great power, would come some experience of conscious function or of consciousness of self-activity, such experiences as are now being pointed out in some introspective studies on will, etc⁹

IV. IS MANAISM PRIOR TO ANIMISM?

It is the usual thing at the present time to speak of the doctrine of manaism as prior to that of animism—to call it pre-animism. The discussion in regard to this question has shown in what a loose, even confusing way, this term animism has been used. The specific formulation of animism is, as is well known, the work of E. B. Tylor (73). Tylor, working with data gathered from among a large number of primitive peoples, found what seemed to be a belief in a "soul." This "soul" was a something variously described; at times as the shadow of a man, at other times as a small man within the man. This "soul" was the principle by which all things were explained. Tylor believed that the concept of this "soul" arose as the *conscious* answer to the question which presented itself to primitive man in regard to the phenomena of dreams and of death. The dreamer saw persons he knew had long been dead and from this concluded that there must have been something within the body that did not disappear when the body did. This observation added to the belief,

⁹ Cf. A. Michotte et, E. Prüm. 'Etude Experimentale sur le Choix Volontaire et Ses Antecedents Immédiate.' *Archives de Psychologie*, 1911, x, p. 194.

N. Ach. 'Über den Willensakt und das Temperament.' Leipzig, 1910.

universally held among primitive man, that life is present in everything in the universe, gave rise to the concept of a ghost-soul.

Some writers have adhered to this strict usage of animism but other writers would include under animism all beliefs which rise through the reading of one's own experience into other things; i.e., even before there arises the idea that there is within one a double which is separate from the body, whatever other experiences are had are read out, projected. This period when willing etc. experiences are read out into things Marett would call "animatism."

This usage of animatism seems perfectly justifiable to us, if what it means be kept clearly in mind. Tylor used animism to mean the belief in ghost-souls and it might lend itself to clearness to retain the term for this purpose. But do not let us extend this restriction to mean that there was a time when man did not have a concept of the soul—the soul meaning self-consciousness. Marett (54:14) illustrates his usage of the two terms in the following passage,

"Thus, when a thunderstorm is seen approaching in South Africa, a Kaffir village, led by its medicine-man, will rush to the nearest hill and yell at the hurricane to divert it from its course. Here we have *awe* finding vent in what on the face of it may be no more than a simple straightforward act of personification. It is animism in the loose sense of some writers, or, as I propose to call it, *animatism*; but it is not *animism* in the strict scientific sense that implies the attribution, not merely of personality and will, but of 'soul' or 'spirit' to the storm."

If one wishes to use the term animism in this way, as we have said, it seems to us justifiable—but to restrict the term soul to mean merely the small ghost-like "mannikin" that is often thought to be within one—does not seem justifiable. The word soul has been so widely used to mean self-consciousness that it cannot be restricted to the sense found in Tylorian animism. Soul for the primitive has not meant merely dream-double as we shall point out in our next section. Soul means self-consciousness and as such has always been present to man's consciousness. This consciousness did not begin at some specific period of human evolution. The concept of self has always been used as an explanatory principle just because the anthropomorphic tendency of man has always been so strong. It was this tendency that made man use the great power, mana, to explain external events. Mana is not *prior* to the soul for it is a *part* of the soul. Mana does not represent an idea that has grown up in an historical sense, but represents a definite psychological experience that comes to

every man. The different things that have been explained by means of mana may be a matter of historical setting or evolution but the genesis of mana as such belongs to man as man.

But the statement by many writers that manaism is prior to animism is for them more than a difference in usage of terms—it involves a denial to the primitive individual of the consciousness of self. By these writers animism is used in the sense in which Marett would have us use animatism; i.e., to mean the consciousness of personality, will, etc., which in turn is ejected outward as an explanatory principle. These writers contend that a great power such as mana is conceived *before* any idea of the soul (self) is present. They state that man does not at first, explain things in analogy to his own soul (used in the sense of self) for he is not yet conscious of himself: he is not yet consciously differentiated out from the group of which he is a member.

Miss Harrison (29:122) in speaking of the system of totemism, which she believes to be based on some such force as mana, states that man at this time has not yet drawn a distinction between himself and a kangaroo for he has not yet said, "This is I." At this time, "his human will is felt chiefly as one with the undifferentiated mana of the world." Levy-Bruhl holds to the same idea when he states that at first man was merely conscious of "participation" but that later as he began to notice himself the idea of the soul arose. Cornford contends that he finds no animistic doctrine in early society. At this early time man feels himself as continuous with the group—the collective life pervades him and he has as yet made no distinction between his own and the collective power. But gradually as self-consciousness comes, the collective consciousness also becomes individualized and we have the idea of the soul come forth. The soul is really only a "pool of mana."

From these representative statements it is plain that it is the supposed complexity of the idea of the soul that makes these writers deny the concept to primitive man. Primitive man simply had not reached the stage when he realized that he had a soul and hence he could not read his image into the universe. But to have an idea of the soul does not mean that you must have some complex, logical idea of it. Doubtless the primitive man is not a Hegelian but he does have some consciousness of self, just as every human being does. These writers seem to think that you must have some definitely formulated concept which you then consciously use as an explanatory principle, in a logical sense. But this is not

necessary for an animatistic doctrine. It seems absurd to us to deny to primitive man an idea of himself when it is generally admitted that there is such a primary emotion as self-elation. Is primitive man to be denied the primary human emotions? Moreover it is not necessary that man in a rational fashion "read" himself out into things. This may very well be accomplished in some affective way—in such a way as has been pointed out in the "affective logic" that has been worked out by Ribot, Maier, Baldwin. These writers show that generalization may be effected as well upon the affective side of consciousness as upon the sense side.

To sum up, then, we have granted that there is a group of facts found among primitive peoples which cannot be placed under the concept of animism—if by animism is meant the doctrine according to which all things in the universe are interpreted in analogy to the human soul, when this soul is thought to be like an image seen in dreams, trances, and so forth. But we have not been willing to grant that the primitive does conceive of his soul in this manner, i.e., we are not to compare his idea of dream-double with our idea of soul, as self, and suppose we are comparing the same concept. We do not deny that at times the ideas of the dream-double and the shadow have played a large, even fantastic, rôle among primitive peoples, but we do not believe that the primitive confuses these ideas with that of the soul or self.

If our contention is correct that mana is simply the power felt within the self when, due to social activities, it feels very efficient, feels an efficiency which contrasts strongly with the efficacy usually felt, then we should expect to find that the primitives had a concept of these different self-efficiencies. And this we can find, we believe, in what has been reported to be a belief in several souls. These supposedly different souls are only different experiences that the self undergoes. The following point of view kept in mind during the investigation and interpretation of such beliefs would throw, we believe, much light upon the discussion. Such a view contends that primitive man functions in the same way as a modern man, just because he is a human being. His social and historical heritage may be very different—but when it comes to the human conscious experiences he is the same being whatever his state of culture may be.

Man notices that he is a living being and he also notices that he has certain mental experiences. Moreover he has such experiences as dreaming, trances, recovery from seeming death, etc. Again he notices shadows. Also as a normal human being

he has an experience which, though mental, is different from all of these in that it seems to make him so much more powerful, namely the experience he has when taking part in a social activity. During this experience the self is felt as much greater than it has ever felt before and yet there is also a sense of identity.

As to the relation of these ideas in the mind of the primitive, our reading of the data shows a state of affairs somewhat as follows. Dream-doubles are not thought to be the same as the consciousness of self, this latter being the experience to which we would confine the use of the term soul. There is a spiritual, i.e., mental part of man which is different from the bodily as well as from the dream-doubles and it is this which is thought by the primitive to be the soul (when used in our sense of self). Mana is the power which like the soul is spiritual, personal—though just how they conceive it to be related to the soul is not so clearly stated. There are indications however, that as Codrington says, mana is thought to be a certain part of the soul or of some souls. Codrington says that mana is not soul for not all persons have mana while all have souls. This is a thing that should be expected. When sufficient observations have been made to show what mana power can accomplish—then when it comes to serve as an explanatory category, only those persons who live up to this standard will be said to *have mana*.

The question of the priority of manaism seems to us then irrelevant. We cannot find any culture where the concept of mana is present that there is not also a belief in spirits in the sense of ghost or dream-doubles. Either concept may assume the leading rôle and which concept shall thus be made most prominent in a certain society, depends upon some "happy chance" just as specific taboos do. Both of these concepts will be present, though with varying degrees of emphasis, just because they are founded upon normal psychical experiences. Such a view does not make primitive man a Berkeleyian philosopher—but makes him like a child (or an adult for that matter) who kicks the chair when he stumbles over it. It makes him a being who tends to anthropomorphize his experiences.

V. APPLICATION OF OUR THEORY TO REPRESENTATIVE PRIMITIVE DATA

In attempting to apply this theory to the facts gathered among primitive peoples, we encounter many difficulties, but most of all that of contradictory reports. For instance for

many years two Kaffir terms, itonga and idlozi, were reported to mean the same thing, namely, ancestral spirits. Dudley Kidd (43:282 seq.), believing that these terms did not mean just the same thing in the native's mind, during a period of fifteen years tried to find out just what these terms did mean to the native. As his analysis seems to be so much in point, we abstract from it at some length.

The idlozi is an individual thing born with the child in the course of nature, is never lost during life, even though the person should become a Christian. At death the idlozi continues its individual existence near the grave of the dead man. The idlozi cannot transcend space and each man has an idlozi to himself. The itonga on the other hand may be divided among the various members of the family. It is not born with the child but is imparted to it by a ceremony after birth. It can depart from a person who abandons tribal custom. It then returns to the grandfather or to the bosom of the amatongi (ancestral spirits) from whence it came out. It has the power of being in several places at once and may be living in the huts of a number of persons at one and the same time and can also at the same time be an immanent spirit in several people at the same time, as if it were a deity or being of wide powers. In fact a hundred people may share an itonga. When the tribe migrates the idlozi of the individual stays near the grave while the itonga goes with the tribe. Mr. Kidd suggests that the idlozi is the individual side while the itonga is the corporate or clan side of personality.

In our more detailed study of the beliefs of certain African and Australasian tribes, let us first consider whether these people *do* mean by the soul what we have contended they do—namely, a consciousness of self or mental experiences. So often it has been stated that by the soul these people mean the mere phenomenon of living or they mean the shadow or they mean the dream-double. That the primitive does relate these things in an intimate way, a way which often leads to confusion in dealing with their beliefs, we must of course grant—but there are too many indications that these things *do mean* different experiences to him to allow us to group all the experiences together and say—this is what the primitive means by soul.

Nassua (57:53-55) who has given forty years of close study to the tribes of West Africa, has a very illuminating discussion of the meaning of soul among these people. He divides the reports which he has received from the natives into four groups.

"1. Ordinarily, the native will say in effect, 'I am one, and my soul is myself. When I die, it goes out somewhere else.' 2. Others will say, 'I have two things,—one is the thing which becomes a spirit when I die, the other is the spirit of the body and dies with it.' But it has frequently happened that even intelligent natives, standing by me at the side of a dying person, have said to me, 'He is dead.' The patient was indeed unconscious, lying stiff, not seeing, speaking, eating, or apparently feeling; yet there was slight heart-beat. I would point out to the relatives these evidences of life. But they said: 'No, he is dead. His spirit is gone, he does not see nor feel; that slight movement is only the spirit of the body shaking itself. It is not a person, it is not our relative; *he* is dead.' . . . Such attempts to distinguish between soul-life and body-life has not infrequently led to premature burial. . . . 3. Another set of witnesses will say that, besides the personal soul and the soul of the body, there is a third entity in the human unit, namely, a dream-soul. . . . 4. A fourth entity is vaguely spoken of by some as a component part of the human personality by others as separate but closely associated from birth to death, and called life-spirit. . . . Others speak of this vague life-spirit as the 'heart.' . . . The natives believe that by witchcraft a person in health can be deprived of his life-soul, or 'heart'; that he will then sicken; that the wizard or witch feasts in his or her magic orgy on this 'heart,' and that the person will die if that heart is not returned to him."

Here we certainly see the soul as different from the dream-double as it is from the mere phenomenon of living. The fourth entity seems to us suggestive of some of the ways in which *mana* is found to be used. It reminds one of the *itonga* that Kidd reports. Significant is it that it is this that the magician desires when dealing with a person.

Ellis (18:155) tells us that the tribes of the Gold Coast of Africa have a belief in two individualities—the living man and the tenanting *kra*. When the man dies the first of these becomes the ghost while the latter becomes a *sisá*, and is then born again. *Sisá* in this way seems comparable to *itonga*. Talbot (70:139) states that the West African believes that the body and soul are entirely different; that the soul is the real man and cannot be destroyed, while the body is something different and inferior, and temporary, and rots away when no longer needed. Junod (42:Vol I:339) tells us that the Thonga locate different psychic qualities in different parts of the body, such as patience in the liver, etc.—"Yet they certainly believe in an independent psychic principle, in a soul."

Similarly we have reports from Australasia that show that a distinction is made between consciousness and mere living. In Motlav, Codrington (8:250) states that the word for soul is *talegi* and it is believed that a ghost can take the *talegi* away from a man and "the man just lies breathing in his chest." Brown (4:193) upon asking the natives of New Britain why

the soul survived the body received the reply, "Because it is different, it is not the same nature at all." This difference is shown also by the belief among these peoples that when a man recovers from a faint or from unconsciousness it is due to the fact that his soul was refused entrance into the other world and was driven back. The man was observed to be alive but his soul or consciousness was gone. Seligmann (66:185) reports that when a man among the South West Koita people falls down unconscious on the road it is because a *tabu* has taken his *sua* (soul). The *barom* (66:734) among the North Massim people was thought to leave the body without death ensuing. A man who lay motionless and scarcely breathing for seven days was thought to have been without his *barom*, which during this time visited the upper world. Among the Mafulu Mountain people (78:266) it is thought that man has "a mysterious ghostly self in addition to his bodily and conscious self." It is hard to know just what is meant by this as Williamson does not tell us what a bodily conscious self is. Best (1:103) states that *toira* (soul) "represents the spiritual and intellectual welfare of the genus homo; while his physical health or welfare is described by the common term *ora*." These quotations show explicitly that soul does not mean mere living.

As to the soul being the same thing as the shadow we give the following representative quotations. Junod in speaking of the Thonga people says (42:Vol. 1:339) that they do not fear to tread on the shadow. "It may even be questioned if they identify the material shadow with the *shitjhuti*, the spiritual part of man which separates from his body at death." Dennett (13:79) who has done a great deal of excellent work among the tribes of South Africa says that when you read a report which says that the same word means breath, shadow, ghost, soul,—you may be sure that the observer has misunderstood the native's thought. "The Bakulu, or souls, of the Bavili have nothing to do with shadows." Routledge (64:240) states that the soul does not depart during dreams or trances for it is the soul that gives a man his individuality, will, ego. Leonard too (49:139) says that it is the soul that gives a man intelligence. Surely soul and shadow are not here synonymous.

Similarly in Australasia we find statements by reporters that souls and shadows are not the same. Codrington (8:250) mentions a belief that a spirit could lay hold of a man by means of his shadow . . . "the shadow being in a way another person or man. But that the shadow was the soul

was never thought." Seligmann (66:189) reports that among the South West Koita people of British New Guinea the words for soul and shadow are entirely different—*sua* for soul and *laulau* for shadow. Nowadays this latter word is applied to photographs and images seen in mirrors. Among the Roro-speaking tribes he finds a similar difference—*aua* for reflection, *oriorena* for shadow, and *tsirava* for (66:309) "the vital forces or essence within an individual precisely as the Koita use the term *sua*." Sometimes the word *tsirava* is used for spirit, although *beriwa* is generally used to mean spirit. Among the South Massim peoples at Tubetube *yaruyarua* was soul and *kwanukwanuna* was shadow. At Bartle Bay however *aru* was reported to mean both soul and shadow. Keyser¹⁰ states that the Kai people of German New Guinea have an idea of soul which is more inclusive than ours in that it included the shadow as a part of it. The soul in fact for these people pervades the body as does warmth. The Kai believe in two souls—that which survives after death, resembling man on earth except in body—and the other is the spiritual essence or soul stuff, which pervades the body as sap does a tree.

In regard to the Fiji Islands there has been some little discussion about the meaning of *yalo*, which was supposed (77: vol. I:24) to be the word for soul and yet to mean shadow. Fison (reported by Frazer¹¹ from a letter of Fison's) thinks this a misapprehension because *yalo* means soul while *yalo yalo* means shadow. Thompson (72:354) writes, "It is difficult to say precisely what the Fijian believes to be the essence of the immortal part of man." The word *yalo* has the following meanings: *yalo* (with pronoun suffixed) means mind; *yalo* with the possessive pronoun separate means shade or spirit; *yalo yalo* means shadow. "From the possessive pronoun being suffixed we may gather that the mind was regarded as being as intimately connected with a man's body as his arm, but that the spirit could be detached from it. . . . The question of the material of the ghost was as much vexed as it is in English ghost stories."

Let us now consider some of the statements about the great force *mana*—let us see what relation we can find between beliefs in regard to this power and in regard to the soul. We have seen that *mana* belongs to the spiritual side of man and can only be originated by personal beings. We have seen that in Melanesia those who during life have had *mana*

¹⁰ See (25:268).

¹¹ See (25:411 seq.).

become powerful spirits, tebarans, when they die. Now what indications are there that there is among the African tribes a belief in such a power? In looking for evidences of such a belief it will be well to bear in mind that for many years it was reported that the Indians believed in a Great Spirit, an All-Father, but that later more scientific, if not more careful, work showed that the Great Spirit was really a great force.

We find an exactly comparable state of affairs among the Masai in Africa in regard to the beliefs about *Ngai*. *Ngai* for many years was supposed to be a supreme God, a great spirit. But Hinde (34:108) reports that the Masai have an idea of *Ngai* as "the Unknown" and *Ngai* "embodied their apprehension of power beyond the human faculties of coping with. Thunderstorms, rains, the telegraph, a railway engine are all referred to as *Ngai* and the word represents the incomprehensible, of which they are vaguely conscious. . . . In a case of accidental homicide or injury it is regarded as the "will of *Ngai*." Routledge (64:226) in describing *Ngai* among the East African writes, "The being thus described is not visible to the naked eye . . . the sun, moon, lightning and rain are all in a sense worshipped as manifestations of the great Power, a conception apparently not dissimilar to that of the poet when he sings of the One

'Whose robe is the light, Whose canopy space.'

The prayer of the medicine-man when he invoked divine aid is addressed to God, the sun of Kenija as 'all the same thing.'"

Livingstone reported that natives of Central Africa believed in the existence of a supreme being called Mpambe and also Morungo (Mulunga) but that Mulunga means a supreme being is questionable in the light of Hetherwick's observations. Hetherwick (32:91-94) reports that the Yaos of the Lake Nyassa region, as well as a large number of other Central African tribes, believed in a great God, Mulunga. Mulunga, Hetherwick states, is impersonal although he finds such statements as that God made the world, man and animals, hard to reconcile with the impersonal idea. Now among these people *lisoka* is the word that means soul, spirit, shade and was both personal and impersonal. *Lisoka* moreover *becomes* mulunga at death and is then an object of veneration. Mulunga is a term that is not, however, reserved for the soul after death but is applied to anything mysterious. "It's Mulunga," they cry when the unusual happens. Also when a man is especially lucky he says, "It's my Mulunga." Hetherwick in his description of Mulunga seems to agree with Miss Werner who describes Mulunga as (76:55) "the great spirit of all men, a

spirit formed by adding all the departed spirits together." Hetherwick also states that Mulunga is the aggregate of human dead souls but not personified. "It is to him (the Yao) more of a quality or faculty of the human nature whose significance he has extended so as to embrace the whole spirit world." Miss Werner however reports that not the whole of the soul lives on but only a part, the *lisoka*. Surely in this report of Mulunga we see more than an impersonal god. Mulunga is that which accomplishes the extraordinary, just as *mana* and *wakanda* do. It is that which runs through the whole spirit world. Only a part of the soul lives on and thus becomes venerated. This belief in a part of the soul as living on seems to be quite common in Africa and seems to be comparable to the belief in Melanesia that it is a certain part of the soul or certain souls that live on to be *tebarans*, the most powerful spirits.

From a study of the tribes of South Nigeria, Talbot gives us very interesting observations and suggestions. Among the Ekoi the term for supreme God is *Obassi* and among the Beni it is *Osa*. *Osa*, however, among the neighboring Yoruba tribes is the generic term for "*juju*" and thus Talbot seems to suggest the possibility of a relationship between "*juju*" and Great God. In regard to "*juju*" Talbot writes that it is a very hard term to translate or understand, though it has generally been defined as "spirits which are present in things." This hardly covers all the usages that he finds as for instance it would not properly describe the Ekoi *Njomm*, which Talbot says can only be translated as "*juju*," and which seems to include all incomprehensible mysterious force, the lowest form of which he compares to the "Melanesian *mana*." This report is merely suggestive of what the relation between a great god and such a power as *mana* may be, but it is sufficient to indicate a rich field for future study. If "*juju*" should turn out to express a belief in such a power as *mana* rather than in spirits it would be interesting to see if the same thing did not hold true of what is termed fetichism. Nassua (57:81) tells us that fetich is equivalent to the following native words. The native word on the Liberian coast is "*gree-gree*," in the Niger Delta, "*juju*," in Gabun county, "*mondi*," among the cannibal Fang, "*bian*." If all of these concepts should turn out to be powers like *mana* we should have a very fruitful field for comparative study. Pechuel-Loesche¹² thinks that magical power rather than spirits is behind fetichism.

In South Africa Junod (42:339 seq.), reports that the belief

¹² See (30:45 seq.).

among the Thonga and Ronga tribes in regard to "*Tilo*" is very hard to understand. This belief in *Tilo* is similar, he believes, to the belief in a Supreme Being found among all the Bantu peoples, a God known under the name of Nzame among the Fan and a great number of West African tribes—Mulunga among fifteen East African tribes—Nkulunkulu in Zululand, etc. *Tilo* seems to mean Heaven but it also means great power, the power in unusual things; storms, death, convulsions, etc. Several beliefs comparable to *Tilo* we have suggested are beliefs in a power like mana—may it not be that this too will turn out to be the same?

st Dennett (13:85 seq.) working for many years in South Africa states that the religion found here may best be called—Nkici-ism, and that it has the following characteristics. *Nzambi* is the great god and the literal meaning of his name is, "the personal essence of the four." Now by the "fours" is meant the group of four powers called, *Bakici Baci*, powers which are spiritual and are connected with objects regarded as sacred. They are in a way offspring or attributes of Nzambi. It is *ki-ci* that signifies that they belong to the great god—for his power is *ki-ci*. In an article later (15:261) than the book from which these statements have been taken Dennett states that the power *ci* is similar to that of mana or wakanda. An interesting feature in this group of facts is that the chief of these people has as one of his titles, Nkicici (Kici on earth). Here we see kici as the great power vested in the chief of the tribe. The socially great are those who have the most mana.

These quotations are sufficient to show that very probably Africa must be counted as one of those regions in which a belief in a great force has sprung up. Moreover we see that this power is very closely related to the spiritual part of man known as the soul. The very close relation which we find between a great power and the Supreme God, we shall consider in more detail in the next section.

As to Melanesia as we have stated Codrington reported that the belief in mana was universal—the whole of magic and religion consisted in obtaining this power. The belief he thought to be common to the whole Pacific.

Explicit statements in regard to this concept among the Polynesians are not so numerous¹³ but we find it stated that *atua* among the Maori, *ane* or *hau* among the Powape, *kasinge* or *kalit* among the Pelew, *anut* among the Kusai are concepts comparable to that of mana. Featherman¹⁴ wrote

¹³ See Marett, p. 126 seq.

¹⁴ Social History of the Races of Mankind, Vol. II, p. 207.

"The generic name of *atua* which is applied to every kind of supernatural being and mysterious objects did not convey a distinct idea of god or of divinity, . . . was a mysterious something which they could not explain, a name given to all active agencies of nature whose mode of action was incomprehensible to them. . . . The strangers that first came among them sending thunder and lightning by the discharge of the fire-arms were *atua*."

Corvan who spent his life in New Zealand states that *atua* means gods. *Mauri* seems similar to mana for as Corvan says (10:107):

"Deep in the heart of the Maori-Polynesian was a belief that everything in nature had its *mauri* or soul-force. . . . The term *mauri* is a difficult one to explain clearly to the *pakeha*¹⁵ mind. It can generally be translated as 'soul' but the Maori does not intend to convey the idea that animals have souls, when he speaks of their *mauri*. Again forests and cultivation-grounds have their *mauri*, the intangible quality that makes them fruitful as sources of food-supply."

Best (1:102) gives a somewhat similar report. Both Corvan and Best report a belief in one God, (*Iho*) held by these people. Statements about *Iho* however very closely resemble those that have been made about Wakanda and we must remember that for some time Wakanda was reported as God. Corvan (10:108) writes that *Iho* comes from the root *iho* meaning the animating force in all things, the primal energizing principle. Best states that *iho* is "the vital spirit in all things."

These quotations are sufficient to impress upon us how much a careful field study is needed to show us what the interrelation of these concepts is. We certainly see an indication that the great power, whatever be its genesis, is certainly that which gives a basis for the belief in a great, supreme God.

Among the tribes of Borneo, Hose and McDougall report facts that certainly suggest a belief in a force comparable to mana. The Kayans believe in two souls, "a ghost-soul or shade . . . and on the other hand the vital principle." The Kayans believe that they are surrounded by spiritual powers—some of which have bodily form and others of which are very vaguely represented as merely a "vital principle." In regard to the Kenyans of Borneo—they write (36: vol. II, 29).

"They may be said to attribute a soul or spirit to almost every natural agent and to all living things, and they pay most attention to those that seem most capable of affecting their welfare for good or ill. They feel themselves to be surrounded on every hand by spiritual powers, which appear to them to be concentrated in these objects to which their attention is directed by practical needs; adopting a mode of expression familiar to psychologists, we may say that

¹⁵ Foreign or uninitiated.

they have differentiated from a 'continuum' of spiritual powers a number of spiritual agents with their various degrees of definiteness. Of these the less important are very vaguely conceived. . . . The more important, assuming individualized and anthropomorphic forms and definite functions, receive proper names."

In regard to the use of the word *Bali*, which is applied to the Supreme God, to the messenger of this deity, to the minor deities—these writers say (36: vol. II, 29)

"The word *Bali* is used on a great number of occasions, generally as a form of address, being prefixed to the proper name or designation of the being addressed or spoken of. The being thus addressed is always one having special powers of a sort that we should call supernatural, and the prefix serves to mark this possession of power. It may be said to be an adjectival equivalent to the *Mana* of the Melanesians or of the *Wakanda* or *Orenda* of the North American Tribes, words which seem to connote all power other than the purely mechanical."

Kruijt¹⁶ in writing of the animism which he finds in the Indian Archipelago states that inferior peoples go through two stages of development. First there is a sort of force scattered through all objects which make them alive and doing, this force is not yet individualized; second there are individual spirits that inhabit everything. The difference in these two outlooks is due to differences in the mentality of the social group. In the first the individual consciousness is not separated from the collective, the sentiment of participation dominates; but in the second the individual has a clear consciousness of himself as distinguished from the social group. As we have stated before we believe these two concepts may be held simultaneously, not necessarily successively.

Warneck (74) has perhaps the most complete study of a people in this group of islands. He studied the Batak people of Sumatra very carefully and finds that the soul-cult is the very core of their religion. He criticizes Kruijt's study as being too broad and too lacking in discrimination in dealing with different areas. The important thing in the religion of the Batak is the rôle of the soul-idea—*tondi*, a "life-strength, life-material, or soul-stuff." The description of this *tondi* is very akin to that of *mana* as several writers have suggested. Warneck states that this idea besets the mind and dominates the practices of the Batak. It is what gives efficacy to the gens and to all things. It radiates in the chiefs and in the powerful. It determines the fortune, rank, moral character of the individual. It comes from the "stock" of souls in the over-world. This belief reminds us of a similar one which

¹⁶ See *L'Année Sociologique*, Vol. XII, pp. 273-275.

Durkheim stresses in Australia as very important for his theory of the totemic principle, and hence mana, as being social. Although the *tondi* is the *soul-stuff*, on the other hand it is the *roha* that determines a man's personal consciousness, his I. But that the *tondi* is spiritual is shown by the fact that the different functions of the *roha* depend upon the *tondi*, often the will of the *tondi* and that of the *roha* are in conflict.

This report may seem hard to interpret and doubtless it is. With our constantly-present preconceptions of what the primitive should believe—our commonly accepted belief that Tylorian animism covers the primitive's religion—it has been hard to get the primitive's real thought recorded. We cannot help seeing however that the primitive idea of the "soul" includes a power which is very widespread among the other parts of the universe.

To sum up then, from a consideration of this data we cannot but believe that the concept of such a force as mana has played a large part in the life of primitive man. Primitive man as well as modern man felt a scale of values in his life. Some things are more powerful and more to be desired than other things. Some things and events give the impression of being extraordinary. The question naturally arises, "What is it that causes these extraordinary events? An answer to this question becomes possible when man has *experienced* a power great enough to do extraordinary things. When is this power experienced? From a study of the great rôle of the social among primitive peoples it seems to us that only one answer is possible—it is the feeling of the social. When one sees the leading rôle that social activities have played among primitive peoples one would expect some influence coming from the consciousness of heightened power which is always experienced in a live group activity. And that we do see it, we believe to be shown by the extended rôle which the concept of *mana* plays. Mana, we believe, is the power which man experiences when he is acting with his group. Given such an explanatory principle it is bound to function to explain all extraordinary things just as we see it among the Melanese, Africans, Indians.

VI. IS MANAISM RELIGION?

Just as animism was very generally called religion—so too manaism has been called. But *is* manaism religion? Before we can answer this question, we must state what we understand by religion. Students of religion have approached its

psychology from two sides. One group has stressed the differentiating mark of religious phenomena as a certain specific attitude on the part of the subject toward the object or objects; while the other group has stressed the specific object or objects toward which the attitude is maintained. Most writers implicitly combine the two, that is religion is defined as a specific attitude toward a specific object—but their stress is generally upon one side or the other.

When you turn to those who stress the object toward which the attitude is held you find emphasized either the object in itself or some unseen being or force behind the object. For instance you find it stated that man's first religion is worship of stones, then trees, then animals, etc. Many writers accept Tylor's definition that religion is a belief in spiritual beings in all things surrounding man. Others contend that belief in spiritual beings is not sufficient for a religion, but that these beings must first be raised to a rank greater than man. Just how these objects happen to become raised to the rank of beings great enough to be worshipped has not been very clearly made out. For instance, Leuba, who insists that the differentiating mark of religion is the *kind* of power on which man feels dependent and from which a certain kind of behavior is elicited; states that this power is felt to be hyper-human and refuses to accept merely spiritual beings as hyper-human. The reason that certain objects come to be regarded as powerful enough for religious objects is due to the "useful" habit of man's mind "to ascribe to unseen beings without regard to their original nature, the ability to supply all the wants of the tribe and the individual. . . . It is a truly remarkable habit,—that of imagining in other beings coveted powers and virtues" (52:112). Many writers make the building up of a god a slow evolutionary process. Perhaps an animistic soul has been singled out and gradually through legend or custom has attained the rank of a god. But whatever the process by which the god, power, or what not has been reached—it must be just such an object before we have religion.

For those writers who stress the psychic attitude as the important thing in religion—we find disagreement as to what this attitude is. Marett as we have seen gives as the core of religion, "supernaturalism, the attitude of mind dictated by awe of the mysterious." Some writers say the sense of the sacred gives us religion, others speak of a religious thrill, others that dependence is the psychic mark of religion. We cannot here enumerate the many states of consciousness that have been emphasized as the basal ones of religion but

we will pass on to a treatment of what we consider to be necessary in order to have a religious consciousness.

In our study of what has been termed the religious experience the following statement covers the factors involved. One feels dissatisfied with himself and makes appeal to a power whom he regards as greater than himself and whom he is confident can give aid. In speaking of this power as personal we use the term personal in the sense which we have already indicated. The question arises—How does one know that there is such a power? Perhaps, someone will contend, we have been told that there *is* such a power, but if one has no further knowledge than this, we do not believe that he can have the confidence necessary to make a truly religious appeal. One finds in reading accounts of religious experiences that they are always described in personally experienced terms. One always *experiences* God or the Power or the Universe, etc. Now before one can appeal to a greater power, we believe that he must know that this power really exists and this he can only know if he has experienced greater power. And, as we have so often said, we believe that he experiences this power in a group activity. We must remember however that to *experience* this power is not the whole of religion. In order to be religious one must feel dependent upon this power and make appeal to it. Unless a person has had help from an object he will not go to that object expecting help. Hence we must explain why man believes he can gain help from a god or other object. He believes he can gain this help because he *has* gained this help, or power. Let us look a little more in detail at the social experience in which we gain the idea of great power. In this experience we find two poles of emphasis: one the power on which the self feels dependent, and the other the power which the self owns or is. In this social activity one feels dependent upon all around him, feels a great power rushing into him from without—but also he feels that he is the one who is experiencing this power—he is the one who can now do wonderful things. During the experience these two aspects are not entirely separated but are in some fashion fused. This power which one feels at this time is not felt as simply an addition to his usual power but there is a qualitative peculiarity in it which is not present in any other experience. It causes a sense of expansion of the self, of happy acceptance of the power felt. Now having gained this idea of greater power the self when he has again sunk to the level of his usual efficiency will at times, remembering how much more powerful he was

at certain times, become dissatisfied with himself and will make appeal to what he regards as having given him this wonderful power, that he once felt. He has experienced this power and so is confident that it exists. The various objects that different peoples have appealed to for this power is to be explained by the fact that different things have attracted the attention as having power equivalent to that which the self has also experienced at certain times. This then is the reason that so many objects have functioned as religious ones. Let an object be observed to accomplish extraordinary things and it will be thought to have great power. What more natural then, than to appeal to this powerful object later when power is desired by the self. Power *has* come in from the outside before—it can come in again. Supposing a man comes back to his social group feeling dependent upon it and asking for the same wonderful power he once received from it—he is, we believe, religious. But as we have said *any* object may function in this way.

If we look at some of the classic psychological accounts of religious experience we will see that the facts quoted lend themselves very well to the interpretation which we have given. For instance let us look at James' account. For James the whole religious phenomenon can best be envisaged as that due to the "divided self." Man feels himself incomplete and there follows the experience of new-birth or the twice-born character. James writes (39:167):

"The psychological basis of the twice-born character seems to be a certain discordancy or heterogeneity in the native temperament of the subject, an incompletely unified moral and intellectual constitution."

James goes on to point out that in all of us, proportionately to our sensitiveness, there is a chaos of higher and lower feelings which for character to evolve must be straightened out and unified in the inner self. Unhappiness and sense of incompleteness result during the reconstruction. One must feel himself incomplete and must surrender himself before he will experience the phenomenon of religion—if he has done this he will be rewarded by having the Holy Spirit rush into him. James writes (39:211): "One may say that the whole development of Christianity in inwardness has consisted in little more than the greater and greater emphasis attached to this crisis of self-surrender." If the self succeeds in surrendering and experiences the second birth he will notice the following things about his religious consciousness. He will feel that he is

of a wider life than that of this world's little selfish interests; will feel convinced of the existence of an Ideal Power; will feel a sense of the friendly continuity of the ideal power with his own life and a willing self-surrender to its control; will feel an immense elation and freedom as the outlines of the confusing selfhood melt down; will feel a shifting of the emotional centre towards loving and harmonious affections.

Now this greater power of whose existence we must be convinced James believes to be truly existent and moreover existent as the sub-liminal self. It is here that "motives deposited by the experiences of life" "incubate" and "when ripe the results hatch out, or burst into flower," in such experiences as conversions, etc. James thinks that psychology has proved that the subconscious does thus break over into the ordinary fields of consciousness. In such incursions we feel ourselves in relation to a "More" and (39:512):

"The 'More' with which we feel ourselves connected is . . . the subconscious continuation of our conscious life. . . . In the religious life control is felt as 'higher;' but since on our hypothesis it is primarily the higher faculties of our hidden mind which are controlling, the sense of union with the power beyond us is a sense of something, not merely apparently, but literally true." James seems to be well satisfied with this hypothesis for he says (39:512) "Starting thus with a recognized psychological fact as our basis we seem to preserve a contact with 'science' which the ordinary theologian lacks."

All of the marks which James gives of the religious consciousness do indeed seem to be present, but in the *interpretation* of these marks we differ from James. James himself criticizes his own theory in the very way in which we should if our own theory is to stand. He writes (38:509): "The practical difficulties are: 1, to 'realize the reality' of one's high part; 2, to identify oneself with it exclusively; 3, to identify it with the rest of ideal being." We believe that our theory answers these three questions. Man realizes the reality of his higher part from experiences which he as normal human being is bound to have, namely a social activity experience. This higher self for us means more efficient, more powerful self and must not be confused with the term higher self as it is used in ethics. By the latter one means the self using its energies to accomplish certain specific ends *judged* more worthy. Again our theory explains why man identifies himself with this power by showing that he cannot help identifying himself with it because he finds himself *being* this power. Moreover since this power is experienced when all around are experiencing, when, as Durkheim has pointed

out, one is first experiencing unity—he necessarily identifies himself “with the all of ideal being.”

James thinks that the sense of incompleteness comes to man because he is a being containing a chaos of higher and lower feelings—but what can this mean other than that man experiences different complexes of consciousness under different situations. We are not born with a mass of separate feelings *labeled* higher or lower, only in so far as these feelings are carried into action and accomplish different results can they be called higher and lower. And this is just what our theory explains. When certain conscious states occur it is when we are experiencing ourselves as selves of a certain efficiency and when others occur we are experiencing ourselves as of other efficiencies. If there is a difference of efficiencies of these two selves then we have ground for comparison and when the self feels incomplete due to the fact that he has before felt more complete he will try to put himself in a position in which he has before felt more complete. We cannot believe that a man says, “Now I shall relax, now surrender myself” and straightway the Spirit rushes in. He does not do this unless he has experienced the Spirit rushing in and felt its benefits. Men or even dogs do not stand expectantly before windows which have never thrown them crumbs. We are just as anxious as James to preserve contact with science and we believe that we have shown a natural empirical experience in which all the factors necessary for a religious experience are found.

Our theory is like Durkheim's in that we make the contrast of the social and the individual self the basis on which religion is built up,—but whereas he makes everything connected with the social—sacred, and hence religious—we would include within a religious complex only those objects which are regarded as capable of giving help; the judgment of this capability depending upon observations of what these objects can do. Sacred, i.e., social, does not make religious—it is supplication that does this. Moreover we differ from Durkheim in regarding the power which makes the object capable of being a religious object—a personal and not an impersonal one. Our theory agrees with animism in holding that the soul is the important thing in religion but it is the soul or self that is experienced as very efficient that is anthropomorphised to become a god.

In all of this we see simply an ejection of a little drama within a person's own mental life. The functioning, experiencing side is we believe the same in all persons. Man due

to his very make-up will by social contact of his immediate family gain some idea of himself.¹⁷ The idea of this self or soul then serves as explanatory category of things that seem of equal power. Then as a social being man is bound to take part in a larger group activity,—be it his own family, with himself as member of course, pitted against his neighbor; his school against another school—or even acting as a whole; his tribe gathering for a sun-dance, or a tribal initiation ceremony—and in this shared activity he receives a peculiar experience in which he feels himself a thousand-fold strengthened. This experience in turn becomes an explanatory category.¹⁸ During this latter experience besides feeling more efficient, he feels dependent upon those around, upon the power entering him—and yet he feels that this power is like his own power—even *is* his own power and thus there arises the sense of the continuity with a great Power and also the conviction that this great Power can help him.

Such an explanation of religion takes into account those primitive forms of religion which are based upon securing power *as* power, i.e., mana: and also those historical religions which have to do with a great Power, but a power vested in a God.

VII. IS MANAISM MAGIC?

In the space of this article we can only give a few indications of the way in which we believe mana to be related to magic. As we have seen, mana has been made by Hubert and Mauss the force which is at the bottom of all magical practises, and since we believe this to be true—let us see how magic will connect with our attempted psychological analysis of the state of consciousness that gives rise to the idea of mana.

Generally, following the lead of Frazer, the acts called magical have been classed as those of imitation or sympathy and those of contagion or contiguity. In the former we have acts in which a *representation* is given of what is desired to take place, for example the act of pouring water in order to make the rain fall: while in the latter the principle of contact is used in order to make that which is desired

¹⁷ The manner in which this idea is built up has been worked out very adequately by Royce and by Baldwin.

¹⁸ It must be remembered that by explanatory, we do not necessarily mean rational in the sense of "intellectual" conception—but rather the primitive "functions," in an affective or motor way, his explanation. He *acts* toward things *as if* they contained certain power like that he has experienced.

take place, as when a man obtains the hair of his enemy so that by torturing the hair the torture will effect the one to whom the hair belongs. Hubert and Mauss criticize this explanation of magic, pointing out that by the principle of contagion *all* things that are near the contagious object would be affected, not merely as in truth is the case, the one that is *intended* to be affected. Moreover all the qualities in the contagious object are not transferred, only those *intended*. Again, consider the fact that the current of this transfer may be interrupted. The transferred quality may be *directed*, as for instance the malady of the eye is sent to the *eye* of the lizard rather than to any other part. Thus the important things in magic, according to these writers, are—the abstraction of certain qualities, the exclusive fixing of attention upon certain things, and the direction of the intention. Similarly imitation is criticized as a working principle in magic. These writers divide all magical practices into manual and oral but state that even in the apparently manual practices really it is the intention of the magician that is important.

Marett states a similar view in saying that the “spell” is the heart of the magical affair—the “spell” really being an imperative willing. It seems then that there is now a tendency to interpret magical practises as those in which imperative willing comes into play. Mana, a great power, is necessary to accomplish the desired results. But mana is a power given rise to by social activity and is a power which every man is bound to experience. Why then is it that only certain persons are magicians? We have seen that in the experience that gives rise to the consciousness of mana there are two poles of emphasis: one on the externality of the power and one on the internality of the power. When the former pole is emphasized we have the basis for religion and when the latter we have the basis for magic. Who then will be the magician? He who during this experience of social consciousness is thought because of his actions to be the one having the most of this power—mana. It has often been pointed out that the primitive magician is the one who is of a nervous disposition, who is perhaps subject to hysterical fits. Such a person is the one who in social activities, due to lack of power of inhibition, would exhibit to the greatest extent the effect of his feeling of heightened activity. It is with this power that the magician works. That it is the power aroused by social contact with which the magician works is suggested by the fact that the magician must have a sympathizing audience with which to work in order to accomplish

his results. Another belief which indicates that the primitive realizes that the arousal of the magician's power is dependent upon action with others is that the magician must very often sojourn in the land of spirits before he can become a magician. Among the Veddas a magician is taken possession of only during public ceremonies.

As to the relation of magic and religion the discussion seems unending. We shall state only two views—that of Hubert and Mauss, (37) with whom Durkheim agrees, and that of Hartland (31). Hubert and Mauss criticize Frazer's theory in which he makes magic a matter of constraint and religion one of conciliation by saying that often the gods were constrained and that in the Intichiuma ceremonies which Frazer classifies as magic, the totems were solemnly invoked. These writers believe that the differentiating mark of religion and magic is to be found in the fact that the religious rites are those of an organized cult which take place in society and in an "open place" while the magical ones are individualistic and seek the "shades."

Hartland holds that magic depends upon the exercise of the personal orenda of the magician while religion is an effort to get the orenda of a more powerful being to accomplish the desired end. Our view of the relation of magic and religion is then the same as that of Hartland, i.e., in magic one who has found he possesses a great deal of power attempts to accomplish certain results, while in religion help is solicited from one who is thought to have a great deal of power. Hartland will not admit however that the idea of this power is aroused during social activities. He believes that the idea of this power is awakened by external nature although he grants that the consciousness of power gained in social activities may organize and intensify this power that has been conceived from watching external nature. We have already criticized the view that nature can give rise to the idea of a power, independent of man's experiencing within himself this power. Also it seems to us that Hartland does not allow room for the very common characteristic of the religious attitude whereby aid is asked for the solicitor in order that *he* may accomplish a certain end. It is not always asked in religion that a being do a certain thing because of the great power which he possesses—but he is often asked to give power to the solicitor. Confidence that such power can be attained demands a specific experience in which power *has* been gained—and this we believe to be found in the group activity experience.

In order to illustrate our position let us look a little more closely at a custom which is quite widespread among the North American Indian. This custom or rite is known among the Omaha Indians as Noⁿ'zhiⁿzhoⁿ. It is a rite that takes place at puberty. Miss Fletcher and La Fleche say of Noⁿ'zhiⁿzhoⁿ. (19:128 seq.). "The literal meaning of the word is 'to stand sleeping;' it here implies that during the rite the person stands as if oblivious to the outward world, conscious only of what transpires within himself, his own mind. . . . At the period when the youth is at the verge of his conscious individual life, is 'old enough to know sorrow' it was considered time that through the rite Noⁿ'zhiⁿzhoⁿ he should enter into personal relations with the mysterious power that permeates and controls all nature as well as his own existence." The origin of this rite is told by the Omaha in his Sacred Legend. "The people felt themselves poor and weak. Then the old men gathered together and said: 'Let us make our children cry to Wakoⁿ'da that he may give us strength.' The old men said to the youth, 'You shall go forth to cry to Wakoⁿ'da.'" In explanation of this rite the Omaha said, "The appeal was for help throughout life. As the youth goes forth to fast he thinks of a happy life, good health, success in hunting." In preparation the youth was taught the following prayer. "Wakoⁿ'da, the permeating life of nature and man, the great mysterious power; here, poor, needy, he stands, and I am he. Here, poor, needy he stands, and I am he." This prayer was called Wakoⁿ'da, gikoⁿ and meant, "to weep from the want of something not possessed, from the conscious insufficiency and the desire for something that could bring happiness and prosperity. . . . The words of the prayer set forth the belief that Wakoⁿ'da was able to understand and to respond to the one who thus voiced his consciousness of dependence and his craving for help from a power higher than himself."

In this rite we see an explicit recognition that man must feel dependent upon the great power and must ask it for aid. The suppliant is not asking Wakonda to do certain things but to give him aid in order that he may be powerful.

A criticism which has often been made of the social explanation of religion may be considered at this point. It is said that such a theory leaves no room for the rôle of the individual often seen in religions and one points to the Messianic religions of the North American Indians as a case in point, stating that here we surely see the tribe borrowing from the individual. This may be true but, we believe, that

a reading of these very religions will show that the Messiah gained his ideas from some social communion—very often from “sojourning in the land of spirits.” The rite of Noⁿ’zhiⁿ-zhoⁿ has also been cited against the social origin of religion—for here, it is said, we see the Indian boy receiving his religion while in the mountains alone. But as we have seen, the Indian boy goes out with a firm belief that he will thus be put into communion with Wakonda, the permeating life of all. We would suggest that the individual reformer in religion is the one who has very well developed within him the sense of the “oneness of all things.” We cannot work out this thesis here but can only say that the lives of such reformers give us this suggestion.

To sum up then our position in regard to these facts we would say that when a man has once experienced mana he may emphasize either the fact that this power came from the outside and that hence he was dependent upon it for his efficacy, or he may emphasize the fact that he is the one who is experiencing this power—he is the owner and therefore a great man. If he feels the former emphasis he is more apt to appeal in after times to an object which he believes can give him this power again, and thus he would be religious. But if he feels that it is he that is great—especially if the group from watching his feats agrees in this judgment—then he is apt to try to use this power to accomplish unusual things and is thus magical. As to the relation of constraint and conciliation in magic and religion we believe that constraint upon a god may be attempted by a magician just because he is so filled with the idea of his own ability to do great things but so long as it is constraint we are in the midst of magic, not of religion. The religious object on the other hand must be invoked and if this takes place toward the Australian totems then we are in the midst of religion and not of totemism. We cannot constrain in religion because the psychological mark of the religious consciousness is that of dependence upon a power regarded as greater. We cannot conciliate in magic because the psychological mark of magic is that of consciousness of great power as owned. That *systems* of religion and magic are closely intertwined in both primitive and modern religions and magics we cannot deny but the psychological root of the two always remains separate.

Manaism then is neither religion nor magic—it is rather, one might say, a fundamental psychological experience. It is merely the experiencing of great power in, we believe, a social activity. It may become the explanatory basis of almost any

sort of experience. Mana power may be invested in *any* object—the object determined by the particular environment in which it is placed. As we have so often pointed out the whole thing is an ejection of our own conscious life in which experiences of differing intensity and quality give us the basis for comparative explanatory principles.

VIII. CONCLUSION

1. There is evidence from all parts of the world that animism, in the Tylorian sense, does not form an adequate basis for primitive man's early reaction to his environment.

2. There are groups of customs and beliefs in this early society that justify the use of some such term as manaism to represent them.

3. Manaism as well as animism results from the tendency of the human mind to interpret things in terms of its own inner experience.

4. Animism is "reading into" things the individual self and manaism is "reading into" things the social self. (Individual and social self used in the sense we have explained.)

5. There is no justification for calling mana an impersonal force.

6. The question of the relative priority of animism and manaism is irrelevant.

7. Mana experienced within the self and then ejected into an object (a fact which shows that the object is regarded as greater than the individual self) and which in turn is sup-
 plicated for aid, forms what is known as religion.

8. Mana experienced within the self and then stressed as the part of the self which makes it capable of effecting things beyond the usual power of man gives rise to practices known as magical.

9. Religion is not a specific objective content, but rather an attitude toward, an appeal for, power which has once before been experienced.

10. Different objective *content* with which experience is knit up forms the difference between primitive and modern man. There is no difference in the reacting, the functional side.

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FRENCH ORIGINS OF AMERICAN TRANSCENDENTALISM

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The writer wishes to apologize for the personal character of the following introductory remarks. At the outbreak of the European war, he was struck by the deliberate attitude, on the part of an overwhelming majority of the intellectual Americans, favorable to the English and the French, and unsympathetic to the German cause. He soon came to the conclusion that we had been laboring for years under some misapprehension; that if the letter spelled German philosophy, German science, German thought, the spirit of the nation had not been very deeply affected. Casual remarks which he had made in the past and which had a bearing on the question came back to his mind; and his curiosity once aroused, he found himself confronted day after day, as if by mere chance, with more and more facts,—all pointing to the same conclusion: German action on American thought was not by any means so great as it was represented to be; French action, on the other hand, had been considerably underestimated. He decided to call on the scholarship of his colleagues, wondering whether they would not, after reflection, feel as he did. With this purpose in view he grouped some of the most interesting data he had collected; and at the meeting of the Modern Language Association in Princeton, at Christmas time, he presented a paper: *Notes on an Unexplored Field of Research, the Relation of French and American Thought in the Eighteenth and Nineteenth Century*.

He had some new information regarding the extent of French reading in the days of the Revolution; he had noted several instances of the serious part played by French educators like Fénelon and Rollin, from the time of Franklin to the time of Emerson; he had tried to visualize with some precision the efforts of Jefferson in the domain of education,—every one of them was inspired by Frenchmen,—and he found them well worth further investigation; he recalled the acknowledged debt of Alexander Hamilton, the Federalist, to Montesquieu. But he must admit that he was especially surprised at the result of his rapid survey of the field with regard to

the German action on American thought in the first half of the nineteenth century; a complete misrepresentation of what had really taken place was evident; just merely possible interpretations of events had become generally accepted as dogmas which no one any longer dreamed of questioning; for instance, even the best and most recent scholars never traced the *German* influence on American thought any further back than *English* writers like Coleridge or Carlyle, or *French* writers like Madame de Staël or Victor Cousin—taking *a priori* for granted the remarkable theory that American thinkers would naturally have borrowed the *German* elements from English and French writers. Or elsewhere vague statements had been converted into positive misstatements; for instance, the so-called Göttingen movement assumed extraordinary proportions; Faust, in his *German Elements in the United States* transforms into "several hundreds," the about 65 students at Göttingen, or the about 125 of which we have a record for all Germany from 1815 to 1850; and the same Faust quietly calls some obscure Emerson studying in Göttingen, *Ralph Waldo Emerson*. Finally extracts were produced to show that Emerson and Whitman, who were claimed as particularly representing the influence of German thought in America, had explicitly repudiated German thought, while the spirit of their works did by no means betray traces of German philosophy.¹

Professor Lanson, who attended the meeting, spoke of the importance of such investigations and of the spirit in which they ought to be made; but as other papers were to be presented there was no further discussion then and there. Many, however, approached the writer in the days following; they either had already under way some investigation, or they proposed to take up some; others mentioned fields which they knew would be promising. It seemed evident that the paper had simply echoed a wide-spread feeling, and one which was ripe for discussion. Finally, a few weeks later the writer received from Dr. W. Girard, of the University of California, who had heard of the Princeton meeting, a copy of a study just completed and which bears on our problem most decidedly. This thesis, written in French, is so interesting for the history of American philosophy that it deserves to be widely known and discussed. All the more so since some scholars (as happens to be known to the writer) are now exploring the same field and it might avoid duplication of effort.

¹ This article will be published shortly with additions to the original.

Dr. W. Girard, at one time student of theology in French Switzerland, had just the sort of training needed to undertake such an investigation. He approached his task with no passion; there are no snappy words, no brilliant displays of eloquence; often long involved sentences render the reading rather difficult; but the result is a complete smashing of the traditional theory (held even by the most modern scholars like Frothingham, Riley, Goddard, Van Becelaere) of the great influence of German thought in America during the golden age of American philosophy and literature.

The complete title of Dr. Girard's book is, *Du Transcendentalisme Considéré Essentiellement dans sa Définition et ses Origines Françaises* (University of California Press, 1916, 145 pages).

By *Transcendentalism* Girard means the American philosophy which reached its full development about 1840. He calls it "the Puritan form of Romanticism."

Ever since the end of the seventeenth century signs of discontent became manifest against dogmatic fanaticism; and Jonathan Edwards endeavored to give a philosophical basis to the austere calvinistic theology. This made things both better (because dogmas were made to look more reasonable), and worse (because it seemed to strengthen a very gloomy view of life). The English and French deism, combined with the usual natural moralism, and which led to a decidedly less ascetic philosophy of life, found an echo in Samuel Johnson's *Elementa Philosophica* (1752), in Franklin, not to speak of Jefferson and Paine. But now, fear of the consequences involved in an agnostic attitude towards the meaning of life, caused the pendulum to swing back again, to Neo-Edwardism (Th. Clapp, and Timothy Dwight), and to Scotch philosophy (Reid)—one representing the theological, the other the philosophical reaction against Rationalism. The period of the Revolution followed, and when this was over, Calvinism with its dogmas of negation of free will, and of predestination, Scotch philosophy (with D. Stewart), and radical rationalism, were again struggling against each other.

Then it was that Americans felt that they must start anew. They looked for a philosophy which would be more cheerful than Calvinism, more inspiring than a philosophy of mere bourgeois common-sense, and also a doctrine of life which would be directly accessible—no more dependent on abstract rationalistic discussions (possible only for a limited number of leisurely people anyway) than on a Revelation—because it must be of a pragmatic nature. The mere expression of these

requirements spelled the answer: the source of such a doctrine is Romanticism, which, although new representatives of it had appeared since, went back ultimately to Rousseau's Moral Conscience: "Conscience, conscience! divine instinct, immortal and celestial voice. . . . Sure guide of a limited and ignorant being, but intelligent and free . . . !" This was to be shaped so as to fit in with the conditions of thought in America. One sees at once already, that not only has this Transcendentalism nothing to do with German Transcendentalism (except when Pure Reason is replaced by Practical Reason—which Kant borrowed from Rousseau), but the first excludes the second: there is no room in a theory of personal conscience for a theory of knowledge such as Kant's, i.e., getting truth by way of philosophical speculation when it has been already imparted directly and as a whole, a theory leading then to the Metaphysical systems of Kant's followers. Truth will be considered again as imparted to man, immediate and whole, by divine revelation; only the revelation is not through Scriptures or Tradition, but given directly by God to each individual man.

That the whole discussion assumed a pragmatic character—chiefly theological and ethical—and only incidentally epistemological, or even metaphysical,—is clear from the definitions given at various times by American Transcendentalists. "Transcendentalism," writes Margaret Fuller, "was an assertion of the inalienable integrity of man, the immanence of Divinity, in instinct" (*Memoirs*, II, 11); "Man," wrote Channing, "may entirely trust the revelation given in human nature, in conscience, reason, love and will" (*Works*, 928). "The transcendental doctrine is the substantive, indwelling spirit of the soul, the real conscience, the religious nature, the source of the inner light, the veritable true, good, beautiful, not as perception, as contemplation, but as substance, as being" (*Dial*, III, 411). And Frothingham defines it: "Transcendentalism was a movement within the limits of liberal Christianity or Unitarianism as it was called, and had none but a religious aspect;" while Cook, discussing Emerson, says: "Transcendentalism identified morality and religion and made intuition their source" (Quoted by Girard, p. 390). The theory of knowledge, as much as there is any, is borrowed from Neo-Platonism (433-4).

Let it be well understood; Girard entirely believes that circumstances led American thinkers to Transcendentalism; that they needed no one to suggest it; and that, wherever it came

from, foreign influence was in the form of presentation; or when occasionally some new arguments were brought in, these were in support of views already held (394).

First then, that being said, what about Germany's influence? Girard finds, just as the writer had suspected, although after a much less thorough examination, that the Göttingen movement did little more in America, for several decades at any rate, than to start an interest in the German *language*, then practically unknown; but "the influence of those who, before 1830 devoted themselves to that study (of the language) is entirely foreign to the formation of Transcendentalism" (397).¹

There was theology: "New-England," said Girard, "was remarkably well informed about theological controversies in Berlin and Jena, Göttingen and Tübingen. In 1819 they were complaining of the unfortunate influence of a system which was ruining the doctrine of inspiration" (399-400). And in the years following the return to Cambridge of Ticknor, the library of Harvard College received books from Germany, "but these books dealt not with philosophy as some might be inclined to believe, but theology, natural history, and philology" (400). Moreover, "we have excellent reasons to believe that the influence of that theology was not considerable" (401), the chief 'reason' being that towards 1835, when this whole movement came to its full development, the social side had eliminated theological considerations entirely.

As to philosophy in the strict sense of the word, the case is still clearer. Ticknor, on his return from Germany, discusses some theories of Wolf on Homer; Bancroft translates some German poetry; and Henri Hedge publishes his *Prose Writers in Germany*, twenty-five years after his return—no philosophy. And to the direct question: What must we think of the influence of Kant and his followers on Transcendentalism, Girard answers: "Directly, that influence has been zero (*nulle*); indirectly, it came about through the spreading in America, between 1820 and 1840, of the writings of Mme. de Staël and Benjamin Constant on the one hand, and of Coleridge and Carlyle on the other hand." Of this we have convincing evidence. "W. E. Channing informs us that he knows of Kant and of his successors only what he found about them in Mme. de Staël and in Coleridge. Ripley also tells us that

¹ Even that was very slow. In 1833, wrote J. F. Clarke, it would have been difficult to buy any German book in Boston excepting Goethe and Schiller; as late as 1843 I rummaged Philadelphia bookstores for German books. (Quoted by Girard, 398.)

he has read nothing by Kant and that he owes all he knows about them to English writers. Margaret Fuller admits that she understands nothing of Fichte, although she studies him in a treatise destined to simplify his doctrine. As to Orestes A. Brownson, he surprises us very much when, after comparing Pierre Leroux with German metaphysicians, he concludes: "*One could not rank very high such men as Fichte, Schelling and Hegel*" (403). The same man wrote, in 1837, in the *Christian Examiner*, these words which seem to represent the general opinion at the time about German philosophers: "We are not aware that any of them, nor that all of them have as yet given us a philosophy of man."

We come now to the part of English writers in the formation of American Transcendentalism, especially Coleridge and Carlyle. Owing partly to the question of language, this is the chief channel through which German influence could come to many; it thus came indirectly as already said, if it came at all.

Carlyle: Girard seems to us right in wondering why Frothingham, Riley, Goddard, and Van Becelaere always associate the name of Carlyle so intimately with that of Coleridge, as a medium of German thought for America. "Because the English historian was first to make his contemporaries acquainted with a literature and a philosophy which England and America had ignored before, this does not necessarily mean that what he wrote about it was to modify immediately the tendency of a philosophical thought—of a thought which moreover had been modified already in its form through the Eclecticism of a Cousin and a Jouffroy no less than through the religious idealism of Benjamin Constant; and this form it kept during all of the first part of the nineteenth century" (410). Moreover Carlyle is the author of *Sartor Resartus*, and in his *Critical and Miscellaneous Essays*, he fears not to say: "Kant's philosophy is not only an absurdity, but a wickedness and a horror; . . . his doctrine is a region of boundless baleful gloom, too cunningly broken here and there by splendors of unholy fire." And further: "Schelling's system differs widely from ours; . . . fairer might it be in us to say that we had not appreciated his truth, and therefore could not appreciate his error" (Quoted p. 411).

As to Coleridge the first question would be: Has he been the faithful interpreter of Kant, Fichte and Schelling? Girard does not answer directly on that point; but the following statements are all we need. "If one speaks of the influence of

Coleridge's writings on the religious thought of Calvinists, and even more of the orthodox Unitarians, we are inclined to believe that it was considerable enough; if, on the other hand, one thinks of their influence on those Unitarians who were called Transcendentalists, we are inclined to think that it hardly needs to be taken into account. We have good reasons for thinking so" (407). One of these reasons is that "there is no relation whatsoever between the notion of religion held by Channing, Ripley, and Theodore Parker, and the notion held by Coleridge" (408). In New England the latter was considered obscure and able to offer only little help to thinkers: "We consider him"—says for instance the *Christian Examiner*, which was on the whole very well disposed towards Coleridge—"as in possession of a treasure of valuable truth, and capable of doing a great service in the formation of manly character, on the principles of a sound philosophy. But the obscurity which has been complained of in his thoughts, is certainly to be found in his style; and that to such a degree as to make what he has hitherto written inaccessible to the great majority of readers." Elsewhere: "He has gained little else than smiles of compassion and ominous shaking of heads by his metaphysical speculations" (Quoted p. 408-9).

We now add this—also from the *Christian Examiner*,—which forms an admirable transition to our next topic: "Had it been given to him to interpret German metaphysics to his countrymen, as Mr. Cousin has interpreted them to the French nation, or had it been possible for him to have constructed a system of his own, we should not have regretted his indulgence of a passion which we must now condemn as a source of morbid dissatisfaction with received opinions, unjustified by any serious attempt to introduce others and better." While Ripley, in his *Specimens* (I, 42) remarks: "The objects at which Coleridge aims are in a great measure accomplished by the philosophy of Cousin" (Quoted p. 409).

Thus we are ready to follow Girard's demonstration that the great part in shaping the theories of American Transcendentalism belongs to French philosophers.

That Mme. de Staël's book, *De l'Allemagne*, was a most important source for the knowledge of German metaphysics in America had been recognized—but then not taken into consideration. After looking into the matter, Girard can write: Transcendentalism owed to this book "not only the interpretation of a few fragments scattered here and there from Ger-

man philosophers, but also, and perhaps more, the rousseauistic idealism expressed in many places" (413). And the same idea expressed from a different point of view: "It would not be difficult to show that what is common to Madame de Staël and to Kant came to the latter through the influence of Rousseau's *Emile* and *Profession de Foi du Vicaire Savoyard*" (415). A few pages further, Girard recalls the fact that W. E. Channing, the same who was to play so prominent a part in the formation of the Transcendentalist Club in 1836, read Rousseau assiduously during his stay in Richmond, in 1798.²

But the chapter on Benjamin Constant is much more striking. Although we knew badly, we did know something about Mme. de Staël; of the influence of Constant, in our days—after the loud claims of the Germans that they had done it all—who was aware? Here there is to learn even for French scholars; for, while in France Constant is first of all the author of a novel *Adolphe*, and a political writer, in America he is first of all the author of *De la Religion*.

Let us here forestall an objection. One might say—and it has been said—that Constant's ideas on religion were ideas he had found in Germany. There are two answers: In the first place it is easy to see that the ideas advocated by Constant, even if he found them in Germany, had been especially powerfully developed in France before, and indeed the Germans themselves knew it well.

Constant praises the Germans for having laid stress upon the two ideas that religious revelation through human conscience is permanent and eternal, and that the dogmatic expression of that inner revelation alone changes; but, of course, both are fundamental ideas in the *Profession de Foi du Vicaire Savoyard*. Then (this is our 2nd point) even suppose these ideas were rather German than French, there still remains the undeniable fact that Americans read them in French books—which after all is the question under discussion. Even though the transcendentalists on this side of the ocean, might have found their theology in German authors, the papers and reviews of the time show conclusively that they did *not* find it there, but in French works. Transcendentalists made use of them to refute the Christian predestinationism of

² An interesting remark is that while usually the action of Mme. de Staël's book is supposed to begin soon after publication, in 1814, Girard can tell that it hardly became known in America before 1820, and the real enthusiasm for the book can be traced to 1829 only (413).

the Edwardists on the one hand, and the rationalism of French and English deists on the other. "The works of B. Constant were received in New England, as soon as they came out, with a favor bordering on enthusiasm, as one will see in reading the numerous articles discussing him in the *Christian Examiner* and in the *Boston Quarterly Review*" (422). E.g. the article, *The Spirit of the Age*, has such sentences as: "Schiller, Goethe, Carlyle are still unfamiliar in America; . . . more exciting are the books of Constant and Jouffroy." Or, "The identity of the religious sentiment is the fundamental idea (in the book *De la Religion*) which one of the most eloquent orators and spiritual writers of the age has developed in the first book of his work" (Quoted p. 423). This was in 1827. In 1838 Ripley was to speak with no less feeling of Constant's importance as a thinker; see vol. 2 (p. 276, 280) of the *Specimens of Foreign Literature*.

It might well be questioned whether Girard rendered his book much clearer by treating separately the theological and the philosophical aspect of Transcendentalism. Mme. de Staël's action was both, religious, when she spoke for herself, and philosophical, when she discussed German philosophers; Constant was not so much a theologian as a philosopher dealing with religious problems; as vice-versa the Transcendentalists never lost sight of religious preoccupations when they wrote along ethical lines. But however that may be, another surprise is in store for us when we reach page 428, under the title *Du Transcendentalisme . . . sous son aspect philosophique*. Just as Girard had revealed to us, after a conscientious reading of the periodicals of the time, the profound action of Constant's book on religious speculations, so also he could record the action of another man to-day practically forgotten in America, the Baron de Gérando, on the American philosophy of the times. "When they did not owe to Mme. de Staël's book their first acquaintance with German philosophy, the Transcendentalists owed them to M. de Gérando's *Histoire Comparée des Systèmes de Philosophie*" (449).

M. de Gérando was introduced to the American public by Dugald Stewart, among others in an article of the *Edinburgh Encyclopedia*. Girard also maintains that besides directing attention to German philosophers in his *Histoire Comparée*, de Gérando contributed much to "the renaissance of studies in Greek philosophy in America before 1830" (see an article in

the *North American Review*, in 1824, vol. 18). Those who know how constantly the American Transcendentalists studied Greek philosophy, will surely understand the importance of this statement by Girard.

In 1824 de Gérando published his own views on philosophy *Du Perfectionnement Moral et de l'Éducation de Soi-même* (450) and a translation of it was published in Boston 1830 (by Elizabeth Peabody). The gist of that philosophy is indeed very transcendentalistic: "It is devoted entirely to prove that man's life is a great and continuous education which aims at all his faculties and takes in all his relations, . . . and that one must endeavor to cultivate any ideas capable of inspiring an intelligent and sincere love of virtue." "We have no ethical work of any living writer," wrote Channing in the *Christian Examiner*, "to be compared with that of Degerando" (*sic.*). And when the translation in English came out, the same *Christian Examiner* again stated: "It holds a station in moral philosophy which has not been filled by any writer in our language, either among the living or the dead" (Quoted p. 453). Girard thus concludes that the idealists of New England owed to de Gérando, besides the interest that they showed for Neo-Platonism, the definite form by which they expressed their ideas about religion, ethics, and the destiny of man (455).

Here again someone may be tempted to maintain that, having lived in Germany, de Gérando was influenced by this milieu. What about it, if de Gérando felt attracted and expressed himself sympathetically regarding such ideas in Germany that had come from, or, at any rate, were in keeping with French and English 18th century philosophy?

If Constant and de Gérando were practically forgotten by later generations, as fosterers of Transcendentalism, Victor Cousin was not. But indeed there is a long way from the part he is supposed to have played according to Riley and others, and the part played in reality. Girard throws a flood of light on this question. Of all foreign philosophers who may claim action in America in the first half of the nineteenth century, he appears now to be without doubt the most important;—not only as regards his own personal philosophy, but as a channel for whatever German philosophy finally made its way into the minds of Transcendentalists. Students were aware of this latter point, more or less; but they never took the trouble to find out what was Cousin and what was German in the theories under discussion. Things were made to look very

simple, namely: German Transcendentalism was like a father to a child to American Transcendentalism [which has never been proved]; Cousin, in his works, which were read in America, dealt with German philosophy [which is true at times]; therefore German philosophy came to America through the medium of Cousin [which is entirely misleading]. It took Girard to say at last: but Cousin was an eclectic; if he took ideas from Germans—as he did from all quarters—he transformed them in throwing them into his melting pot of Eclecticism; thus whatever German thought there was in Cousin—and whatever American students at the end of the nineteenth century choose to call them—they were no longer German Transcendentalism.

If moreover one passes to the further question: what elements did Cousin take from German Transcendentalism for his Eclecticism?—the answer is this: "The French philosopher keeps hardly anything from Kant except his notion of free-will. . . . While the center of personality for Descartes was in thought, for Kant and Cousin it was in moral obligation. Take free-will from man, he will live like a plant. . . . He "can" because he "must," and he "must" because he "can" (466). This means ultimately much more than at first appears; for we know very well that, at the end of the eighteenth century, Rousseau had before Kant, spread those notions of "Practical reason," of conscience, of free-will. Thus what Cousin brings over from German philosophy to America, is after all, as has been said, French philosophy.

Another remark: If one does not measure things by the space allowed to the discussion of German philosophy, but by the conclusion reached, Cousin has not even changed his position after the contact with Kant and his followers; he may use perhaps other terms now more in fashion, but his attitude towards the moral significance of life was the same which he had proposed in common with the Scotch philosophers in earlier years, i.e., based on the existence of a direct moral sense: the supreme end of man, he connects with "a faculty of the mind different from all others and the function of which is to give us the idea of the good, as the function of reflexion is to give us the ideas of reflexion, and that of the exterior senses to give us sensations" (p. 462-3).

Besides the domain of ethics, there is that of natural philosophy; there one could maintain that a closer relation exists, namely between Cousin and Schelling. But, adds Girard, this part of the philosophical problem "has no connection with Transcendentalism" (407); and we might add,—

for those who think they can consider Cousin as a mere satellite of Kant and Schelling—that, if Cousin thought much of Schelling's philosophy, Schelling thought as much of Cousin's philosophy. See the Preface Schelling wrote for Bekker's work on Cousin (p. 468, note).

Now, before closing this chapter, let us borrow some of Girard's proofs that Cousin, and not German Transcendentalism, was the godfather of American philosophy before 1840! Not in the sense that he actually proposed, to his admirers on this side of the ocean, a system of which they had never thought before, but rather—as already pointed out—that they found in him a clear expression of what they were looking for, and of what they had a vague anticipation. More than that; "The ideas and arguments which will strike them when they read Cousin will not differ so much from those which they had already appreciated in Mme. de Staël and B. Constant, or in de Gérando, or other forerunners of French Eclecticism yet. Only they will find them, in the indisputable master of this new philosophy, firmer, better defined, more scientifically worded, and they will rejoice that such a scholar and such a philosopher as the famous Parisian professor should have devoted the best of his intelligence and of his eloquence, to defend religion in the very name of science, and to have rehabilitated human nature in the name of religion" (470-1). Ripley will say in his Introduction to the *Specimens*: "Cousin's Eclecticism exhibits to the speculative inquirer in the rigorous form of science, the reality of our instinctive faith in God, in virtue, in the human soul, in the beauty of holiness, and in the immortality of man. . . . It establishes on a rock the truth of the everlasting sentiment of the human heart" (Quoted p. 479).

Owing to the popularity enjoyed at the time by the *Edinburg Review*, Girard thinks that the article published there by Sir William Hamilton, in 1829, on French Eclecticism, must have called first the attention of American scholars to Cousin.

In July of the same year, Alexander H. Everett, just called to the editorship of the *North American Review*, published the Preface of Cousin to the *Fragments Philosophiques*.

And during the same year still, the same review published an account of the principal works already printed by Cousin (*Translation of Plato, Cours de Philosophie*, 2 vol. of *Fragments philosophiques*).³

More important than these accounts, of course, was, in 1832, the publication of a translation (made by Kinberg) of Cousin's

³ Cousin's Translation of Plato contributed largely, after de Gérando, to encourage the study of Greek philosophy in New England.

Introduction to the History of Philosophy,—with a long review again in the *North American Review*.

In 1834, another translation of the same work (this time by C. S. Henry) was published, under the new title of *Elements of Psychology*, with an Introduction, notes, and additions. In eight years, it had three editions. And from that book was made, Girard tells us, a textbook for colleges, which was still in use in 1861 (473).

Then, in 1836-37, Orestes A. Brownson, the most speculative mind among the Americans of that generation, came around to Cousin. He had started as a disciple of Locke, whom he left for Reid and Stewart; a period of scepticism had followed which was a sort of reaction against the sentimental and romantic feelings which had filled his soul after reading Bernardin de Saint-Pierre, Constant, and Chateaubriand. In 1833 he founded the *Boston Quarterly Review*; both in this and in the *Christian Examiner* he published articles on Cousin (473). In 1836 in his little book, *New Views of Christianity, Society and the Church* he acknowledges his debt to Cousin—and to France: "She (France) exerts and must continue to exert a powerful influence on all southern and western Europe, and on our own country in particular. She is, as it were, the missionary nation of the world, and it is not a matter of indifference to other nations whether she preaches the true gospel or another. Her doctrines have immense weight in England; they reign supreme in this country; Germany reaches us only through France" (Quoted p. 474). As a counterpart of this quotation, let us reproduce this one of Cousin—who had been elected foreign member of the American Institute, Girard tells us—in his Foreword to the third edition of his *Fragments Philosophiques*: "While my writings on Education (this alludes to his famous *Report on the State of Public Instruction in Prussia* several times reprinted in America) thanks to the fine translation by Mrs. Austin spread in most of the States of the Union, sometimes under the auspices of public authority, the *Fragments*, together with my *Lectures*, founded, without my knowing it, a philosophical school in the country of Jonathan Edwards and of Franklin. But do you know what favors the new philosophy in New York and in Boston? It is, with its moral and religious nature, its method" (Quoted p. 475).

Finally, in 1838, came Ripley's *Specimens of Foreign Standard Literature*—all of which specimens are chosen from the works of Cousin, Jouffroy and Benjamin Constant. With regard to Cousin, the editor remarked: "I may venture to say

that there is no living philosopher who has a greater number of readers in this country, and none whose works have met with a more genuine sympathy, a more cordial recognition. He is destined, in my opinion, to exert an important influence on the development of thought in our youthful land" (Quoted p. 477).

Not very much less important, as regards his influence on American thinkers of that time, was the distinguished author of *Mélanges Philosophiques*, and of the *Cours de Droit Naturel*, Théodore Jouffroy, the disciple of Cousin, and who laid so much stress on the moral aspects of philosophy. Not stopping to mention the flattering references to him in *Blackwood's Magazine*, in 1826, and in the *Edinburg Review*, since 1830, attention ought to be called to an account in the *Christian Examiner* (1830) of the article *Du Scepticisme*, which Jouffroy had contributed to the *Encyclopédie Moderne* (vol. XX); then in 1837 a review, by Brownson of the *Cours de Droit Naturel*; then as a consecration of Jouffroy as a recognized authority, the generous part allotted to him in Ripley's *Specimens of Foreign Standard Literature*. "No article more than *How Dogmas Come to an End*"—says Girard—"was so well made to arouse the interest of the Unitarians who were anxious to do away with dogmatic Calvinism; and in the essay *Philosophy and Common Sense* they found again all the essential features of Scotch philosophy" (487). Finally, in 1839, W. H. Channing published the translation of the *Cours de Droit Naturel*, preceded by an important *Introduction*.

In view of all this, it is difficult to escape the conclusion that American Transcendentalism, if one wishes to look at it from this point of view of foreign influence, was more than anything else an outgrowth of French Eclecticism, even more—since Transcendentalism and Eclecticism are contemporary—than of Scotch Idealism. And the more one looks into the matter, the more the German share grows smaller. Such telling passages as already quoted, "One could not think very highly of men like Fichte, Schelling and Hegel," or: "We are not aware that any of them (German thinkers) have as yet given us a philosophy of man" (Brownson) confirm fully such passages as found by the writer under the pen of Emerson, writing about at the same date: "On the whole what have those German Weimarish friends done? They have rejected all the traditions and conventions, have sought to come thereby one step nearer to absolute truth. But still they are not nearer than others. I do not draw from them great influences. The

heroic, the holy, I lack. They are contemptuous. They fail in sympathy with humanity. The voice of nature they bring me to hear is not divine, but ghastly, and hard, and ironical. They do not illuminate me, they do not edify me . . . " (*Diary*, April 26, 1837). Or Walt Whitman, some years later: "While the contributions which German Kant and Fichte and Schelling and Hegel have bequeathed to humanity . . . are indispensable to erudition of America's future, I should say that in all of them, and the best of them when compared with the lightning flashes and flights of the old prophets and exaltés, the spiritual poets and poetry of all lands there seems to be, nay certainly is lacking something—something cold, a failure to satisfy the deepest emotions of the soul—a want of living glow, fondness, warmth . . . " (*Late Thoughts and Jottings*, IV, 322).

As a matter of fact, American Transcendentalists never could understand German philosophy; how then could it inspire them? In 1827 the *Christian Examiner* tells us that "Schiller, Goethe, Carlyle, are still unfamiliar in America" how much more must it have been the case with philosophers! In 1830, in *Blackwood's Magazine*, which Girard assures us was read as much then in New York and Boston as in London and Edinburg, we read about a translation of Kant: "Either it is nonsense in a degree possible only to utter and determined ignorance of the German language; or it is so close a translation of the *ipsissima verba* of Kant, as to offer no assistance to an uninitiated student, to say nothing of the barbarous effect produced by a German structure of sentence and terminology altogether new" (Quoted p. 440). Again, a contributor to the *Christian Examiner*, in 1833, speaking of Kant, too, writes: "We believe it impossible to understand fully the design of Kant and his followers without being endowed to a certain extent with the same powers of abstraction and synthetical generalization which the German philosophers possess in so eminent a degree. . . . The work of the transcendental philosophers may be translated word for word, but it still will be impossible to get a clear idea of their philosophy, unless we raise ourselves at once to a transcendental point of view" (Quoted p. 441). Here is the *Quarterly Christian Spectator*: "We have been repeatedly told that it is impossible to translate German philosophy into English. If it is so we ought not to complain of the failure of any attempt to teach us its mysteries." Here is Brownson once more: "There is no overwhelming fondness for German literature and philosophy. The genius of our country is for Eclecticism."

And here is Ripley: "The first condition of popularity among us is the clear expression of distinct thought. For this reason the German philosophers, in their native costume, will never become extensively popular in this country. The fruits of their inquiries will some day pass into general circulation among us; but not till they have been defined and clarified by successive operations in different minds. . . . We must start with the freer, more popular, more concrete and more finished product of the great French writers who have been formed in the German school." . . .

All the above refers of course to German Transcendentalism in America *before 1840*. How things would look if one examined Hegelianism in America after 1850, or even 1860, with the same care as Girard has done for German philosophy in the first half of the century, the writer could not now presume to say positively; but, from what he has read he would not be altogether surprised if the state of affairs proved to be not very different; namely that German philosophy, even then, even after Dr. Harris's so-called St. Louis School, was hardly known from first-hand knowledge. Possibly, one would find that the Englishman Green was the Cousin of that new half century as regards acquaintance with German Transcendentalism.

P.-S.—Since this article was written, Girard's position has been rather severely attacked by G. Sherburn, of the University of Chicago, in *Modern Philology*, Sept. 1917 (p. 125-128). In the writer's opinion, Mr. Sherburn's retort is very unconvincing. He picks flaws, but he does not in the least shake the argument; indeed he strengthens it if that is all one can oppose to Girard. With regard to the French influence, he is forced to agree that the contribution is important. With regard to Girard's "anti-German" position, he fails to make one strong point. He certainly gives no proof that American philosophers of the time knew German philosophy. And nobody who has read Girard can deny that the burden of proof rests now with Mr. Sherburn. The historians of philosophy and of literature, *later*, said repeatedly that there was close connection between American and German thought in the first part of the nineteenth century; not the contemporaries. And the assertion of historians has not the slightest value if it is not born out by the testimony of the contemporaries—which testimony is lacking, and this is precisely the interesting revelation of Girard. The weakness of Mr. Sherburn's own argumentation is well illustrated by the following sentence of his criticism: "With regard to Miss Fuller the fact that she said she could not understand Fichte is far from proving that she was uninfluenced by him" (126). Well, no! Let us suppose that it is *very* "far" from proving it;—at the same time, if the influence of Germany has to rest on such strong constructive arguments, Girard's thesis is not very seriously threatened yet!

ETHICAL ASPECTS OF CHILKAT CULTURE

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INTRODUCTION

The Chilkat, a tribe of the Tlingit linguistic group, live at the head of Lynn canal, north of Dixon entrance, in "Russian" Alaska. In 1890 the population was estimated at 812; the census of 1910 gives the population as 690.

The ensuing account is based on information obtained in Philadelphia in 1912 and 1913 from Louis Shotridge, or Xarits, a native Chilkat from the village of Klukwan. Mrs. Gerda Sebbelov Guy assisted in procuring the information and to her is due the credit for a considerable portion of it.

The informant's viewpoint has been considerably affected by his contact with civilization and cannot with any assurance be accepted as typically Chilkat. Since the tribal life is broken up into hierarchical social units it is doubtful whether any typical individual view of tribal life is to be found, since individuals necessarily see their social world from different backgrounds and with varying interest in its component parts. This was realised by the informant himself who frequently pointed out that the appeal made to him as a member of one of the two dominant groups might differ somewhat from the appeal made by the same facts to a member of one of the lower clans.

TRIBAL ORGANIZATION

The Chilkat are divided into two exogamous groups, or moieties, known respectively as Eagle and Raven. These moieties are composed of smaller totemic groups, or clans, as represented in the following table:¹

EAGLE,	RAVEN,
Bear	Whale
Killer-whale	Raven
Eagle	Giant
Wolf	Worm
Fishhawk	Frog
Shark	

¹ Swanton gives the fundamental divisions of the Tlingit as Raven and Wolf, but states that in the north the latter was known also as Eagle. (26th Annual Report of the Bureau of American Ethnology,

There is a chief for each moiety and one for each clan. The chief of the Whale clan is, *ipso facto*, chief of the Raven moiety, the chief of the Bear clan being, similarly, chief of the Eagle moiety.

Many facts point to the moieties as the fundamental divisions. A man belongs, first of all, to a moiety and his duties to it take precedence, generally, over his duties to the tribe. One moiety may fight with another tribe and the complementary moiety refuse to participate. Relations between the two moieties may become strained to the breaking point of open hostility. At such times wives leave their husbands and go to the houses of members of their own moiety. Should they suffer injury at the hands of members of their husband's moiety, redress would be demanded from that moiety by the moiety to which the wives belong. On one occasion, a few years ago, a fence of sticks was built through the village to keep the two moieties separate. Only messengers were allowed to cross it and any other who attempted to do so would be killed.

Punishment for serious offences, such as murder and adultery, is meted out by the moiety to which the injured person belongs. In one instance, a man while drunk had murdered his wife. Her clan was higher than his, and her moiety decreed that his sister and mother must die to expiate the crime. They were, accordingly, shot by members of the murdered woman's moiety. Two days elapsed before final decision was reached on the punishment to be exacted, as the consent of the moiety of the murderer to the decision was necessary. This was obtained only after several deliberations

1904-5. See, also, E. Sapir, Social Organization of the West Coast Tribes. Trans. Roy. Soc. of Canada, May, 1915.)

In an account of the tribal organization of the Chilkat published by Shotridge in the *Museum Journal of the University of Pennsylvania*, Sept., 1913, he adheres to the divisions of Raven and Eagle. The subdivisions, however, differ from those given the writer at an earlier date and listed above.

His published list is as follows:

EAGLE,		RAVEN,	
Chief	{ Grizzly Bear	Chief	{ Whale
Family	{ Killer-whale	Family	{ Raven
	Murrelet		Kosh-day-woo-si-ta-ye-ka (human
	Wolf		spirit turned into land otter.)
	Eagle		Monster Worm
	Spirit of Tsih-ko River		Frog
	Shark		Crow

In this list also there is one more clan in the Eagle moiety than in the Raven.

and many interchanges of messages between the two moieties. A similar circumstance arose and was similarly decided when the young chief of one of the moieties was known to have seduced the wife of the chief of the other moiety.

Marriage of a parent with a child is forbidden; otherwise, the ethics of marital relations seems determined by the moiety exogamy and the clan levels. A man may marry his father's sister for she is not of his moiety. It is alleged that a man might marry even his paternal grandmother, but under no circumstances his maternal grandmother. 'To marry a member of your own moiety is the same as to marry your own sister.'

Both social and economic specialisation is represented by the clan divisions. The Bears are the carvers; they are aristocratic and have considerable leisure; the Killer-whales are the speakers and advisers. The Sharks are the warriors; they can fight like sharks. The Whales made the first blankets, and at the present day do the weaving.

The order of the clans given in the above table represents the respective levels at which marriage is possible. Thus, a Bear should marry a Whale, a Killer-whale a Raven, an Eagle, a Giant, and so on. It is very important that a woman marry on her own level. A man may marry where he likes so long as he does not violate the moiety exogamy. A woman who marries below her moiety, or without the tribe, loses membership in her clan and cannot be reinstated. Her children also are barred. A man belongs where he is born and there is no way in which he can rise to a clan higher than his own. The superior clans are not, however, always the more wealthy ones. A man of the Bear clan may be very poor while one of the Shark clan may be very wealthy. Many of the Sharks are, at present, people of considerable wealth, though this does not entitle them to any higher social position. On the other hand, display and a big show only secure the disapprobation of members of the more aristocratic clans who know that the pretenders are, after all, "only Sharks." The Eagles are the speakers and councillors. The Killer-whale people, for example, might call in a Shark rather than an Eagle to give them advice, the personal worth of the man being the determining factor. In wealth the Frog people now stand next to the Whales; yet they were spoken of by Shotridge disparagingly as being the kind of people who "do a little thing and go out of doors and howl about it." The inequality of the clans is reflected in the demands made upon the moiety as punishment for the crime of one of its members. The

murderer referred to above was of a clan lower than that of his wife and his moiety was required to sacrifice two individuals 'to even things up.' If the murdered woman had belonged to the same clan as the murderer only one life would have been required in expiation. This method of punishment affords an additional reason for discountenancing unequal marriages. In this instance the murderer wept and begged to be allowed to die in stead of his condemned sister and mother; but this the moiety of his wife would not permit.

Relations between members of the same clan are generally pleasant though not invariably so. Disputes between clans are arbitrated by the moiety, as are also serious disputes between members of the same clan, if they cannot be settled within the clan. Usually the clan decides disputes which arise among its own members. There is today ill-feeling between two groups within the Bear clan which is explained as follows: Several generations ago the oldest son in the line of descent married a woman of a lower clan and a younger son was made chief to his exclusion. The respective supporters of these two men form two factions at the present day.

In former days members of different clans within the same moiety did not mingle freely, and even to-day the boys in their games observe these clan distinctions. They will run away from a boy of a higher clan, for parents must pay for an injury done by their child to the child of another. When the chief of a moiety is injured by a man of the complementary moiety the entire moiety of the offender must make redress. The moiety of the offender will then perform one of the ceremonial dances which is the property of the moiety of the offended chief.

SLAVES

Slaves were sometimes captured from the Haida or Tsimshian and sometimes captured in war. War captives were given the choice of death or slavery, and if they made the latter choice were expected to abide by it. Escape was seldom attempted and almost never successful. The mountains of the interior shut out hope of escape by land and the water routes remained the only alternative. Each chief had a trained crew of sixteen rowers who held themselves in readiness to pursue fugitive slaves. When sent on such a mission they were told: "You will receive such and such punishment if you do not capture and bring back that slave." As a matter of fact they always did capture the slave even if he had started a day or two in advance of them. The owner of a slave might

administer such punishment as he chose. As a warning to other slaves, the owner of a fugitive slave might inflict death upon one who had attempted to escape, or he might punish lightly or not at all. Slaves were usually well treated and were worthy of confidence. Some of them were old and trusty story-tellers whose principal occupation was to look after the children of the higher families. Some became wealthy and might themselves own slaves. They were sometimes given their liberty, as, for example, at the building of a new clan house or moiety house; but they could never claim liberty. Three generations ago when the house of the Raven moiety was built, the chief of that moiety freed six slaves for each post. He could then boast of having 'freed the Kwakiutl tribe.' The informant's father when he, as Raven chief, built the Raven house, freed slaves as the respective corner posts were put into the ground. He ordered the respective slave to put his mark on the post near the end which was planted in the earth. The post was then dropped into the hole which had been prepared for it and the slave told: "You are free."²

Slaves owned by cruel masters would attempt to escape while those owned by kind masters did not wish to leave.

TRADERS AND VISITORS

There seem to have been few winter tribal visits except such as had to do with trade in one form or another. The Kwakiutl did not visit the Chilkat, "probably because they were afraid to come among us." The most intimate relations were with the Haida and the Stik, from the Yukon. When a Haida chief came to visit, the Chilkat held dances and games to entertain their guests. The entertainment was provided by all the members of the higher clans. Some chiefs were very poor not knowing how to take care of their money. If a wealthy chief came and the chief of the corresponding Chilkat moiety were too poor to entertain him, the members of the other moiety would provide the hospitality. When a large party of Haida came in their canoes for trading purposes they were saluted by the Chilkat, who gave them a dance by way of friendly greeting. The Haida then came ashore, washed, dressed in dancing costume, and gave a dance by way of returning the greeting. Everything needed was provided for the Haida as long as their visit lasted.

The Chilkat met the Yukon or Stik Indians once a year

² Formerly slaves were killed when the house posts were erected (Swanton; Krause).

at a place intermediate between the tribal lands, for the purpose of trading. Here, too, dances were given in extending and returning greetings, the participants being decorated with eagle and ptarmigan feathers. Even the mothers carrying babies on their backs joined in the dances. Each man traded with a special man year after year, and would trade with no one else until he had offered his wares to him and he had gotten what he wanted. This right to trade with a particular man seems to be an inheritable right. Shotridge's father traded with a special man among the Stik Indians, this right having been willed to him by the latter's maternal uncle. This Stik would trade with no one else until Shotridge's father had come; when exchange with him had been effected, he was free to trade with any one.

The Kwakiutl are spoken of disparagingly as a people who "do nothing and are no good." "They say they fit their heads to their head-dress; they ought to make their head-dress fit their heads. We have some sense; we fit our head-dress to our heads. That goes to show what they are. The Stik Indians are fine people. They live out of doors, get their food by hunting, and move their camp when they want new food. They live close to nature; they dance when in the mood; they are like animals—they live so close to nature." For the Indians of the Plains, with whom the informant had little acquaintance except through Museum collections, he had the greatest contempt. "They have only beads and showy things. But take the Pueblo Indians. They have some sense. They make pottery with designs that resemble our own. There is some sense to that." Throughout his discussion of other tribes it was noticeable that those who were like the Chilkat were "sensible and had some judgment," while those of different culture were "foolish and had no sense," but our informant seemed quite unconscious of the basis of his distinction.

THE FAMILY

Much of the social life centers about the family. Husband and wife may begin married life in the home of his parents, in that of her parents, or in a house of their own. But the proper place, if they have no house of their own, is the house of the husband's mother's eldest brother. The families dwell in wooden houses in which live sometimes one, sometimes two, sometimes as many as five or six families. The family of the chief and his slaves always have a house to themselves. One of the informant's uncles, a member of one of the higher

clans, shared a house with another family, but his own portion of the house was separated from the rest by a partition. "It is more sociable to be together. If one family can not get along with the others it moves to another house; but there is seldom any trouble." Each house has a head. This position may be filled by a woman or by a man. In those families in which more than one family live there is a communal house-life in which all participate.

"We do not marry out of love but out of respect. We are not told to love one another but to respect one another." Each shall be mindful of his or her duties toward the other especially as regards kind treatment and performing the allotted tasks. Neither divorce nor separation is recognised.

EDUCATION BY STORY AND TRADITION

In each house, not necessarily in each family, there is some one person whose particular duty it is to tell stories to the children. Some of these stories relate the origin of the tribe and of the various clans; some contain a moral, either by way of direct suggestion, or by recounting the misfortunes that befell those who disobeyed an honored custom or expressed command.

The stories are usually told by the older people, sometimes by the women, more often by the men. Frequently this duty falls upon one of the old trusty slaves, probably a Kwakiutl who is well versed in the affairs of the tribe. The Kwakiutl sometimes introduced Kwakiutl stories, usually, but not always, mentioning their origin. When, as sometimes happens, an uncle, a grand-uncle or a grand-parent comes to live in a family he or she will act as story-teller. Every night the children, both boys and girls, gather around the fire to listen to these stories. If they show signs of drowsiness the narrator cleverly inserted some amusing anecdote, perhaps something irrelevant to the story to renew their flagging interest. This rouses everyone; all laugh and the narrator again has the lively interest of his auditors. As a result of this method the stories come to incorporate elements which did not originally belong to them. The stories proper are said to contain no humorous portions.

When the children are about fourteen or fifteen years of age they tell the stories which have been narrated to them, the old people listening and making corrections. This they do for some time, both boys and girls, until they are well versed in the art, the younger children, meanwhile learning from them.

Some of the stories are very long—so long that the narrator has to stop for bed-time. It will be resumed the following evening. If the narrator has left a story incomplete the children will not fail to remind him of it the following evening. They are told only in the winter evenings. There is no taboo on telling stories in the summer, but the people are too busy to narrate them.

Children are told to obey and not ask many questions. Frequently a story is referred to by way of enforcing obedience. The children rise early in the morning, the oldest one building the fire and preparing breakfast. An incentive to be up early may be found in the following teaching: "The spirit of Success passes by early in the morning. He comes in to warm himself at the first fire that is built. He is an old man. He comes in to warm his hands. That is why you should be up early."

In the higher clans the children eat apart by themselves and before their elders have eaten. They have their own plates and knives. This is done to keep them from wanting things which the elders have; also, because they will not then annoy the parents.

Among the edibles taboo to children are sweets, food imported from without the Chilkat territory, any animal that they cannot themselves procure, and shell-fish, lest they be poisoned by the 'copper' that is often found deposited upon shell-fish.

The following story conveys its own moral:

A boy was down by the river setting snares for water fowl. He was hungry, ran back to his mother and asked for something to eat. His mother took from the basket a piece of salmon that was slightly mouldy on one side. Now mouldy salmon is the very best kind. But the boy did not know this. He threw the salmon into a corner and said in anger, "I did not want mouldy salmon."

At this moment another boy called out, "A duck is in the snare." He rushed to the bank of the river, and, while attempting to get hold of the duck, waded out too far and was covered over by the water. All about him he found fish talking his language. He scarcely knew whether they were human beings or fish. It was an interesting experience and he forgot about his home. He went to the village of these creatures. Here he found himself in a village of these fishes and did not know how to get out of it. The first thing that attracted his attention was a salmon lying in the street—that is, in one of the creeks which, to him, looked like streets. His companion said, "When you feel hungry push over a young fellow, pick him up, carry him away and eat him." Seeing a fine young fellow ahead he pushed him over, picked him up and carried him away. He had been told by his companion not to leave any pieces of the salmon lying around after roasting it, but to burn up all that was left. He did as he had been told. When he returned his companion asked him what

success he had had. Just then the salmon which he had roasted came back crying from a pain in one eye. "Go back and see whether some portion was left unconsumed by the fire," said his comrade. He returned and found that one eye of the salmon was in the ground at the end of the stake. (Fastening the salmon to the end of a stick in this manner was the first method of cooking.)

Next time he chose a humped-back salmon. His companion bade him pull the bark from a certain tree, put it around the fish and roast it in that. He pushed one over and carried it away. He pulled the bark from both sides of the tree, placed the salmon within it, stitched the bark around with spruce root, then covered it over with swamp cabbage and leaves, and put the whole in a heated pit where he had placed hot stones. (This was the origin of the present Chilkat method of roasting salmon.) The color of the bark was left on the fish. Later he saw this humped-back salmon crying from a pain in its jaw. Returning to the place where he had cooked it he found that a part of its jaw was not consumed. Another time he had carried off a piece of salmon and was eating it when he heard someone remark, 'Mouldy head.' Thereupon he discovered that he was among the Salmon people. Now, 'mouldy head' was the very expression his mother had used when she gave him the piece of salmon to eat. He felt home-sick and wished to go home. He observed two large swans jumping up and down in the creek. His companion said, "Jump upon the back of that swan." He did so. The swan was now sometimes in the water and sometimes in the air. He forgot his home-sickness. Next day he heard noises coming from a large house. The people within were feasting and dancing. It was the Herring house. He asked permission to enter. "You must be clothed properly," he was told. He obtained regalia and his partner gave him medicine to rub on his body. He was anxious to enter the house. He placed his eye to a crack in the boards to ascertain what was happening within. His eye was filled with herring eggs which he had to have picked out one by one. He watched the occupants gliding about within the house, then entered and joined the processions. While the boy was under the water he learned a great deal about fish. In the spring they all started away; first, the smelt, then the herring, and so on, until all had left. He was told to choose the party in which he would go.

He chose the party composed of those who were painted—for to him they all looked human. The smelt cried out, "We served human beings before you performed such service." The salmon replied, "They did not get much out of you; only soup from your head." The herring cried out, "We served human beings before you did." The salmon answered, "They did not get much out of you; your head is too bony." Each of the fishes in turn, made their claim to priority and to each of them the salmon shouted out their own superiority. The boy's companion said, "Jump up into the canoe of your father."

He jumped toward the canoe and called to his father.

His father said, "Jump again." He knew that this was said to him merely as to a salmon, and he felt badly. He then saw his mother and his companion bade him go to her.

He called to her, "Mother, here I am." She called to her husband, "Come quickly; here is a fine big salmon." The salmon-boy was frightened and went away. His companion said, "Go to her; do not be afraid." His mother called out, "Come quickly; here is a dog salmon." A hook was put down; he switched his tail around

and was fastened on it. He knew nothing more until his mother began to clean the fish which she and her husband had taken. She could not cut off the salmon's head. Upon examining it she found around the head of the salmon the copper ring which the boy had been wearing about his neck. She called her husband, pointed the ring out to him, and they procured the services of a medicine-man. The medicine-man put the salmon in a bark bundle and placed it upon a shelf. All of the people in the village fasted for four days. At the end of this period sounds were heard proceeding from the shelf. By this they knew that all was going well, and they then broke their fast. Within eight days the boy was restored to his parents. When he grew up he became a medicine-man. (This is the origin of the treatment now accorded to all animals, the unconsumed portions of their bodies being always burned.)

The informant had heard this story from a Flathead slave who had been raised by the Tsimshian, but it is said to be a Chilkat story. This method of restoration is referred to by Swanton. The story is found also among the Chinook and the Haida.

Other stories, patterned somewhat after the above salmon story, have to do with the other animals. In this way the children are taught never to make fun of any animals and never to torment or speak slightly of them.

Boys

A male baby is called t! *ukáneye*; from the time a boy can walk until he is of marriageable age he is known as *atk!eyátsk!*; after this as *yesgá*. From the period of puberty until marriage he is sometimes known as *yadóok*.

The training of boys is under the care of both the father and mother, the mother, of course, having most to do with them when very young. Either parent may administer punishment, though a child is seldom punished. A boy who behaves properly is treated as a grown-up person. "Some boys are as dignified and as helpful as adults. My mother treated me as she treated her own brothers. My sister believes that the average boy has as much sense as an adult. 'For,' she says, 'if you tell them something, they remember twice as long as a grown person, because there is nothing on their minds to worry them.'" There is full confidence in the efficacy of proper training: "If you start a child right it goes right all its life—there is nothing to stop it. If started wrong it goes wrong all its life. The character of the child and of the man depends altogether on how it was started and trained. My sister also believes this. She was merely repeating what my mother had told her. She never whips her children—they are too good. This is because they have been trained properly. My mother used to say to her: 'Always give the

children plenty of food so that they will not want any. Food keeps children cheerful.

"A child can not be trained after it begins to walk. You may as well allow it to go its own way then. On the other hand you cannot begin too early. As soon as a child is born you can train it. If you overdo it, however, the child becomes crazy, foolish. After they have begun to walk you must leave them alone until they can talk. Even then the only further training you can give them is to correct them when they go wrong.

"Some boys are raised from the cradle to be hunters. If the people wish to make the child a good hunter, they bring to the cradle each morning before day-light, the skull of a wolf. This they place on a box near the child. They shake him (to rouse him?) and pant, imitating the wolf, while the child gazes at the skull. A bear's skull may be used in the same way. Sometimes the nose of a recently killed wolf or bear is cut and rubbed against the similarly cut nose of the child in order that the blood of the two may be mingled. The child when it grows up will be able to smell as well as a bear. "His nose is cut on it," is an expression equivalent to "he is very adept at it." Instead of bringing the heads to the child he is sometimes taken out in the morning before breakfast and shown the stuffed head of a wolf or of a bear. This is kept up until he can walk, that is, until the age of about two years. "After this you can put nothing into their heads—it seems to slip out." In this, as in other things, to select the wrong time of day or to continue the training too long, will result in overtraining the child and will make him foolish.

The informant's father had had the mixing-blood treatment applied to him when a child and could smell like a bear. "Once when we were out in the interior upon a mountain, my father sniffed the air and said, 'I smell white man.' No one else in the party could smell the white man. But he was right. Four white men were encamped several miles away. He had as good a nose for horses."³

Until they are about ten years of age children are not allowed to go away from the village alone, but must be in

³ "The minute a child cried its breath was caught in a bag. Then the bag was carried to a place where many people were passing so that it might be trodden under foot. This prevented the child from crying much when it grew older.

"If a woman wanted her girl baby to become neat in later life, she put on her breast the borings that come out of a woodworm's burrow and let the child suck this substance along with her milk. Red paint was put on a child's nose to make it strong." Swanton, p. 429.

groups of two or more. Each boy has a special friend or comrade, though boys mingle freely together, with the exception of the clan distinctions above referred to. The age at which a boy will be allowed to go off and hunt alone depends upon the courage exhibited by the lad. The following incident shows something of the hardihood of younger boys and the value placed upon this quality by elders.

Two boys, ten or twelve years of age, taking with them a rifle, went out to hunt grizzly bear. Their mother wept loudly when she heard that the boys had left the village and could not be found. Their father said he believed they had gone to hunt grizzly bear. After a search of a day and a half they were found. From a ledge they had shot a bear at close range, and had removed a portion of the hide as evidence of their achievement. The father was much pleased; he had not expected the boys to become hunters so soon. One of the boys, who is now a great hunter, had been with his father on hunting expeditions and knew the surrounding country and the places which promised game. The father remarked, "That boy usually asks questions every time he sees a bear brought in; where to hunt, how to get there, etc."

The informant once saw a boy of the age of eight or nine years bringing in a lynx from his traps some ten miles away. "I congratulated the boy's father, who replied, 'Oh, he does that every day!' His father was a great trapper and the boy had learned hunting from him."

Formerly, a skilled hunter made no secret of the place where, or the manner in which, animals were to be taken. Hence, although a boy profited most from the experiences of his father if the latter was a good hunter, he might learn the tricks of the trade from any other experienced man.

GIRLS

Until the age of puberty boys and girls mingle freely together, participating in the same games and associating without restraint and without the supervision of their elders. After this period the girl is looked upon as having arrived at womanhood and is not allowed to play with the boys.

At puberty the girl is secluded behind a curtain or screen in the house and remains here during four moons. During this time she is attended by an older woman, a slave, if her parents own one, otherwise a sister or her mother. Previously to this she has been taught weaving and textile work; now her mother teaches her how a woman should conduct herself,

the duties of a good wife, and the conduct that will befit her from now on.

When she comes out of her seclusion she is, it is alleged, of much lighter complexion and can then marry. But she no longer has the freedom of her girlhood days. On the contrary, she must wear a long large bonnet which projects forwards and downwards so that she can see only two or three feet ahead, and when she goes out must be attended by the slave or a female relation. From puberty until marriage her hands are wrapped in cariboo thong so that they may not come into contact with any object. This is done 'to keep them tender.' She is not allowed to cook or do other work, for she must be kept as 'pure' as possible.

A girl baby is called *t!ukáneye*; from the time she can walk and talk until puberty, she is *satk!átsko*; from then until middle age she is *yésawat*; after this she is known as *sawát*.

The father takes no part in the training and teaching of girls. Until the age of puberty he may punish them. After they have passed through the puberty ceremony he has no authority over them except as regards their marriage, for which his consent as well as that of their mother is necessary.

Girls are admonished to be quiet and not cry. They are constantly reminded, 'You are girls and not boys.' They have little say in the selection of a husband, the marriage being arranged by the parents. Girls are said to be more gregarious than boys. A girl does not have a chum or special friend as does a boy.

THE AGED

The care of aged parents generally falls to their daughters. Women have a more tender feeling for their parents than do men. Sometimes, however, they go to live with one of their sons, especially if one of the latter is wealthy and the daughters are poor.

The old women braid and prepare the sinew and ropes but most of their time is given to teaching the children. The aged are respected, and it is a disgrace to permit others to support the grand-parents if the grand-children are able to do so. "I have seen a poor married couple support their grand-parents and refuse help from the chief." A man is under especial obligation to provide for his maternal grandmother.

POSITION AND INFLUENCE OF WOMEN

The economic tasks of women differ considerably from those of men. The men do the hunting, fishing and wood-

cutting, the women the basketry and quill work.⁴ Yet women may do men's work. "So much the better if they can do men's work. My aunt and my wife's aunt used to wear men's clothing, when out of the village, and do men's work. If a man wove baskets or did any of the tasks proper to the women the people would make fun of him. They would say he was more a woman than a man. I know a man who sews, weaves and does women's work; he is called a *g!áthau*, which means, half man half woman. In the olden days the people would kill such a man. It was thought a disgrace that a strong man should act like a woman.

Men and women have their distinctive dress and neither sex may use the garments of the others. A woman of sound judgment is much respected. She may speak at the tribal meetings and her words will receive the attention which they merit.

DISPOSAL OF THE DEAD

A child is buried in the simplest manner; so is a woman who has shown no special merit. To the body of a man who has done a great deal for the tribe considerable attention is shown. When, for example, the informant's father died, the Raven moiety was invited to participate, members from the neighboring villages coming in large numbers to sympathise and pay respect. They marched through the village dressed in their best clothing. The informant's grandfather was the first Chilkat to be buried, cremation having been practised up until that time.

The body of a still-born child was placed in a box and cremated. They put it back into the place from which it had come, that is, into the spirit realm. Old people are looked upon as having done their duty and are respected at death in much the same manner as the wealthy. If the deceased were a poor man the survivors contributed money and clothing. Should relations make much ado over the burial of a man of no account people would laugh at them. A chief's funeral is an important affair, lasting from eight to ten days, in which everyone participates. When Shotridge's maternal grandfather, a moiety chief, died, all the members of this moiety stopped work for eight days, dressed in their best clothes and paraded through the village. Large pipes were provided for the three or four hundred people from without the village who had been invited to the funeral. The relations of the

⁴ Krause says that both men and women assist in mending the snowshoes, a part being assigned to each sex. p. 208.

deceased told stories and sang songs relating to the merits of the deceased. The entire moiety of which he was chief were active participants and the complementary moiety was invited to attend. His popularity had been such that the entire tribe wished to help in raising the totem pole over his grave. But Shotridge and his brothers refused the proffered aid and erected the totem pole without other assistance.

The body of the deceased is respected because "it is the custom and you cannot get away from it. If you did not do something it would be like a dog's grave. You must not allow a human being to lie like a dog." Moreover, the dead are helped by what is done for them.

A QUALITATIVE AND QUANTITATIVE STUDY OF WEBER'S ILLUSION¹

By MABEL ENSWORTH GOUDGE

I. Introduction	81
II. Qualitative Experiments	82
A. The Nature of the Illusion at Various Regions of the Body in the Case of a Single Observer.....	82
(a) General Procedure	82
(b) Results	83
(c) Comparison with Weber's Results.....	90
(d) Experiments with Other Observers.....	90
B. The Influence of Various Conditions on the Illusion..	93
(a) Correspondence of the Illusion at Certain Regions with Differences of Sensitivity at these Regions	93
(b) Continuity <i>vs.</i> Discontinuity of Movement..	97
(c) Variation in Rate of Movement.....	99
(d) Effect of Visualization: Experiments with Blind Observers	99
(e) Ease of Localization and Variations of In- tensity and Clearness and of Quality.....	103
(f) Racial Differences	106
C. Summary of Qualitative Results.....	107
III. Quantitative Experiments	107
A. Introduction	107
B. Method	107
C. The Regions Examined.....	108
D. The Results	108
(a) The Equivalence Ratios as Measures of Sensi- tivity and of the Illusion.....	115
IV. Conclusion: The Psychology of the Illusion.....	117
V. Summary	119

I. INTRODUCTION

In 1834 E. H. Weber described a tactual illusion which now bears his name.² When compass-points, kept equidistant, are moved with equal pressure over a cutaneous surface of varying sensitivity, the observer experiences a converging and a diverging of the two paths; a converging, when the points pass

¹ From the Psychological Laboratory of Cornell University.

² E. H. Weber, *De pulsu resorptione auditu et tactu, Annotat. anatom. et physiol.*, 1834, 59-75; *Tastsinn und Gemeingefühl*, in Wagner's *Handwörterb. d. Physiol.*, 1848, III, 524 f; *Ueber den Raumsinn und die Empfindungskreise in der Haut und im Auge, Ber. d. Sächs. Ges. d. Wiss.*, 1852, 93 ff.

from an area of greater to one of less sensitivity, and a diverging when they pass from an area of less to one of greater sensitivity. Weber indicated, in some detail, the form of the illusion as found at twelve different regions of the body.

Although the occurrence of the illusion, since Weber's time, has often been verified, and although authors have not agreed as regards his explanation of it, the illusion has never received systematic study. It seems to involve not only differences in sensitivity of the skin, but also perception of movement on the skin, relative localization of two moving points, and estimation of the distance between these points. We do not know whether the illusion is found on all parts of the cutaneous surface, whether a discontinuous movement would produce it, what rate of movement is most adequate for it, etc.

It is, then, such a systematic study (with these suggestive problems before us) that we have undertaken. We have explored the entire bodily surface for the illusion, and we have compared our results with those of Weber. We have also undertaken a qualitative study of the various factors which condition the illusion, and a quantitative study by means of which we hoped to compare direct judgments of relative distance with the indirect judgments of the illusion. In our quantitative work we employed the method of equivalents, a method first used by Weber and Wundt, later worked out by Fechner, then improved by Camerer, and standardized as laboratory method by Titchener.³ It has recently received some criticism at the hands of Gemelli.⁴ We have, however, adopted Titchener's form of the method, in the hope of obtaining a set of results adequate to a critical examination from the methodological point of view.

II. QUALITATIVE EXPERIMENTS

A. *The Nature of the Illusion at Various Regions of the Body*

The purpose of this part of our study was to explore the entire cutaneous surface for the illusion, and to obtain qualitative descriptions of the perceptive patterns which were aroused.

(a) *General Procedure.* The bodily surface was divided into forty-two regions; seven on the face, sixteen on the trunk, seven on the arm-hand, and twelve on the leg-foot. In the case of all bilateral parts, the left side or member was always arbitrarily chosen. These forty-two regions, which included the twelve described by Weber,

³ For a history of the method see E. B. Titchener, *Experimental Psychology*, ii, 1905, 191 ff.

⁴ A. Gemelli, *Il metodo degli equivalenti*, 1914.

were all explored by a single observer, and some of those which yielded the most clearly defined illusion were again explored by other observers. The instrument employed was the Griesbach aesthesiometer with hard rubber, slightly conical points, having a terminal diameter of 1.15 mm. The amount of pressure, which was approximately 19.5 gr. as measured on a chemical balance, was kept as nearly constant as possible. The three experimenters who took part in the experiment were practised in maintaining a uniform rate of movement; the average rate which obtained in a large majority of the experiments was 6.25 cm. per sec. The average rates for the two other experimenters were approximately 10 and 8 cm. The separations of the points of the aesthesiometer might, theoretically, be neither less than the two-point limen for the place of greatest sensitivity nor greater than the anatomical boundaries of the region to be examined. Within these limits, however, a considerable variation was possible; and since six experiments were made on every observer for a given region, various separations could be employed for every region. The actual separations used will be found in the tables. The directions of the parallel paths traced by the aesthesiometer were (1) longitudinal, *i.e.*, identical with or parallel to the median line of the trunk, face or limb; (2) horizontal, *i.e.*, at right angles to the median line; and (3) diagonal, *e.g.*, across the trunk from shoulder to hip. In the diagonal as also in the longitudinal directions the movement of the points was anterior-posterior on the face and trunk, and proximal-distal on the leg.

Wherever possible the observer, who was always blindfolded, reclined on a couch elevated by supports to a height of 1.2 m. This position allowed a free manipulation of the instrument, and secured the minimum of muscular tension on the part of the observer. The following kind of instruction was employed: "I am going to move a pair of compasses down the volar side of the left arm from near the shoulder to the finger-tips and I want you, immediately afterwards, to give an account of your experience. There will be the usual signals 'ready' and 'now.'" The observer's report was facilitated, at least once in a series on a given region, by an outline drawing of the region examined. Since the drawings served no other purpose than to aid the experimenter in obtaining accurate reports, they will not be included in our results.

The observers who took part in these experiments were Dr. C. A. Ruckmich (R), instructor in psychology, Mrs. L. D. Boring (Bo), instructor in psychology at Wells College, K. M. Dallenbach (D), J. S. Johnstone (J), and Miss J. N. Curtis (C), graduate students in psychology, Miss F. A. Bean (Be), an undergraduate majoring in psychology (Wellesley College), and the writer (G). Miss Colpitts served as experimenter when the writer was serving as observer.

(b) *Results.* Tables I-IV give the results of observer G, upon whom the entire forty-two regions were explored. The tables show the region examined, the number of cases, the actual separations in *mm.*, and include a brief description of the perceptive pattern. In the last column the numbers 1, 2, 3, etc., indicate the order of change in the relative direction of the two lines.

TABLE I

OBSERVER G. FACE

Number of cases for every region, 6

Region explored	Separations	Summary of results
I. Ear to ear over lips. Left to right.	25, 20, 15, 30, 20, 25	1. Gradually diverging to corner of lips. 2. Quickly diverging from there to center of lips. Illusion same on both sides.
II. Tongue; left margin, apex, right margin.	3, 2, 4, 2, 3, 3	Very slightly diverging on left margin to apex.*
III. Lower jaw; left to right ear. (One point on, the other beneath jaw.)	30, 25, 20, 35, 25, 20	Diverging from left ear to tip of chin. Right side corresponding.
IV. Forehead; right to left.	30, 25, 35, 20, 15, 25	Parallel.
V. Middle of forehead, down.	25, 20, 15, 30, 25, 20	Parallel.
VI. Left ear to just below clavicle; over middle of cheek and neck.	40, 35, 45, 50, 40, 45	1. Parallel or gradually converging on face. 2. Parallel on neck. (Distance less than "1".) 3. Parallel on chest. (Distance less than "2".)
VII. (A)—Center of lips to clavicle, over chin and neck.	35, 30, 30, 40, 25, 35	1. Gradually converging. Distance between initial and final distance very great.
(B)—Clavicle to center of lips, over neck and chin.†	35, 30, 30, 40, 25, 35	1. Parallel on neck to Adam's apple. 2. Then, diverging to lip. Distance between initial and final distance very great.

* Experimenter found it impossible to move compass over left margin satisfactorily, and so there is doubt of the accuracy of this report.

† This reverse direction was given on account of its mention by Weber.

TABLE II
OBSERVER G. TRUNK
Number of cases for every region, 6

Region explored	Separations	Summary of results
I. Across breasts; right to left.	55, 55, 60, 50, 45, 55	1. Parallel to right breast. 2. Diverging on right breast to nipple. 3. Converging, nipple to sternum; distance on sternum very small. Illusion same on left side.
II. Ventral side; right shoulder to left hip.	55, 50, 60, 55, 60, 55	Parallel, with slight decrease on breast-sternum regions.
III. Ventral side; half-way between median line and left side, clavicle to pelvic region.	50, 60, 65, 55, 45, 60	Parallel.
IV. Ventral side; median line, clavicle to pelvic region.	60, 55, 50, 45, 55, 55	1. Parallel to upper sternum. 2. Slightly converging on lower sternum. 3. Then slightly diverging. 4. Converging, lower pelvis.
V. Dorsal side; left to right shoulder. (Corresponding to breast region.)	50, 60, 65, 55, 60, 60	1. Doubtfully diverging to middle of shoulder blade. 2. Converging to spine; distance on spine less than on side. (Right side corresponds to left)
VI. Dorsal side; left shoulder to right hip.	60, 65, 60, 65, 75, 70	Parallel.
VII. Dorsal side, half-way between median line and left side; top of scapula to below waist.	60, 55, 65, 50, 65, 70	Parallel.
VIII. Dorsal side; half-way between median line and left side, waist over buttocks and upper leg to knee.	70, 75, 65, 80, 90, 75	Parallel, until about two-thirds distance between buttocks and knee; then gradually diverging to end.

TABLE II—*Continued*

OBSERVER G. TRUNK

Number of cases for every region, 6

Region explored	Separations	Summary of results
IX. Dorsal side, median line; neck to buttocks.	55, 60, 65, 60, 65, 65	1. Slightly diverging on neck and shoulder regions. 2. Then, parallel. 3. Slightly diverging near buttocks.
X. Around neck.	45, 30, 25, 30, 20, 25	1. Doubtfully parallel in front. 2. Diverging from right side to spine. 3. Thence converging to left side.
XI. Around trunk; level of shoulders.	50, 65, 60, 65, 55, 60	Parallel, with slight divergence across chest.
XII. Around trunk; level of lower ribs.	45, 40, 50, 45, 50, 45	1. Parallel on dorsal side. 2. Parallel—but distance greater—on ventral side.
XIII. Around trunk; level of waist.	60, 60, 55, 65, 55, 60	1. Parallel on dorsal side, slightly converging over spine. 2. Parallel on ventral side, diverging over ribs.
XIV. Around trunk; level of hips.	50, 55, 60, 45, 50, 55	1. Parallel on dorsal side. 2. Parallel, but distance greater on ventral side.
XV. Upper arm to hip; over volar side of arm, axilla, side.	60, 50, 55, 55, 60, 55	1. Parallel on upper arm. 2. Slightly diverging on axilla. 3. Diverging over ribs. 4. Converging to waist.
XVI. Left ear to elbow; neck, shoulder, upper arm (lateral) to elbow.	40, 45, 50, 50, 55, 55	1. Converging to clavicle. 2. Then parallel to elbow (slightly diverging twice from clavicle to end of shoulder).

TABLE III

OBSERVER G. ARM-HAND

Number of cases for every region, 6

Region explored	Separations	Summary of results
I. Lateral side; near top of upper arm to finger-tips.	45, 45, 40, 43, 45, 43	1. Parallel, upper arm. 2. Diverging on elbow. 3. Parallel, forearm (or slightly diverging toward waist). 4. Diverging, wrist. 5. Slightly converging, back of hand. 6. Slightly diverging, fingers.
II. Volar side; near top of upper arm to finger-tips.	35, 30, 35, 40, 40, 35	1. Parallel, upper arm. 2. Converging on elbow. 3. Gradually diverging to wrist, sometimes, parallel halfway down arm. 4. Then, slightly converging to palm. 5. Then, diverging to finger-tips.
III. Around upper arm, halfway between axilla and elbow.	50, 60, 45, 65, 40, 50	Parallel.
IV. Around elbow.	40, 50, 55, 60, 45, 50	Parallel.
V. Around forearm, halfway between elbow and wrist.	30, 35, 25, 40, 35, 40	Parallel.
VI. Around wrist.	15, 20, 25, 20, 25, 30	Parallel.
VII. Around hand.	20, 25, 30, 35, 20, 25	Parallel (distance once doubtfully less on dorsal side).

TABLE IV

OBSERVER G. LEG-FOOT

Number of cases for every region, 6

Region explored	Separations	Summary of results
I. Ventral side; near top of upper to middle of lower leg.	60, 55, 65, 45, 60, 55	1. Parallel on upper leg. 2. Gradually diverging on knee and lower leg.
II. Ventral side; middle of lower leg to end of toes.	35, 40, 30, 25, 30, 35	1. Parallel to vicinity of ankle. 2. Diverging over ankle. 3. Then slightly converging. 4. Then gradually diverging to end of toes.
III. Dorsal side; near top of upper to middle of lower leg.	50, 60, 65, 60, 65, 70	1. Parallel on upper leg. 2. Slightly converging on knee-joint. 3. Gradually diverging on lower leg (twice, parallel, but distance greater than in "2").
IV. Dorsal side; middle of lower leg, over heel and sole to toes.	20, 25, 30, 20, 15, 25	1. Fairly parallel to vicinity of ankle (here, it was very often just a band of pressure, distances of compass points limited to size of ankle). 2. Then diverging to near tip of heel. 3. Then parallel over sole (distance between paths less than in "2").
V. Lateral side; near top of upper leg to sole of foot.	60, 65, 55, 50, 60, 60	1. Parallel on upper leg. 2. Diverging on knee region. 3. Parallel (twice, parallel to only one-half or two-thirds distance to ankle; then gradually diverging). 4. Diverging over ankle. 5. Then slightly converging. 6. Then gradually diverging to sole.
VI. Median side; near top of upper to middle of lower leg.	65, 60, 55, 70, 75, 65	1. Parallel to or just below knee. 2. Then gradually diverging.

TABLE IV—*Continued*

OBSERVER G. LEG-FOOT

Number of cases for every region, 6

Region explored	Separations	Summary of results
VII. Median side; middle of lower leg, ankle and sole.	35, 25, 40, 30, 40, 35	1. Parallel to vicinity of ankle. 2. Gradually diverging to sole of foot. 3. Parallel.
VIII. Around upper leg; halfway to knee.	65, 60, 55, 70, 50, 65	Parallel.
IX. Around knee.	35, 40, 30, 45, 20, 30	Parallel.
X. Around lower leg; halfway between knee and ankle.	40, 30, 45, 25, 35, 40	Parallel.
XI. Around leg above ankle.	30, 40, 35, 45, 30, 60	Parallel.
XII. Around foot.	25, 30, 20, 30, 15, 20	Parallel (sometimes doubtful whether distance on top of foot greater than on sole).

The tables show that the illusion is found in 55% (24 out of 42) of the regions examined. It occurs more frequently in the longitudinal than in the transverse direction; the ratio of occurrence to absence in the former direction is 15:3, in the latter, 8:11. The only regions where the illusion is found in the transverse direction are across the face, the tongue, around the trunk at the neck, the shoulders, the breasts, and waist. There are two places around the trunk, however, at the lower ribs and hips, where the two lines were perceived as parallel, but where the distances between them were greater on the ventral than on the dorsal side. These two cases we have regarded as doubtful.

The most marked illusions occur in the following regions: (1) ear to ear over lips; (2) lower jaw,—ear to ear; (3) centre of lips to clavicle; (4) across breasts; (5) upper arm to hip,—volar side of arm, axilla, side; (6) ventral side of trunk, median line; (7) lateral side of arm-hand; (8) volar side of arm-hand; (9) ventral side of leg-foot,—middle of lower leg to end of toes; (10) dorsal side of leg-foot,—middle of lower leg, over heel and sole; (11) lateral side of leg-foot; (12) median side of leg-foot,—middle of lower leg, over

ankle and sole. There is a close correspondence in the course of the illusion between corresponding parts of the arm-hand and leg-foot regions; but the illusion is more marked on the former.

(c) *Comparison with Weber's results.* The illusions as reported by G correspond for the most part with those mentioned by Weber for the same regions. The differences are given in Table V.

TABLE V

Region	Place of change	Weber's results	Our results
Across breasts.	From side to centre.	Diverging all the way.	Parallel to beginning of breast, then diverging.
Lateral side of trunk.	Over ribs from end of axilla.	Converging.	Diverging.
Same.	Between last rib and hip.	Diverging.	Converging.
Ventral side of trunk, median line.	Upper part of sternum.	Diverging.	Parallel.
Lower leg over calf to arch of foot.	Lateral side of leg—foot to arch.	Diverging.	(a) Parallel. (b) Diverging at ankle. (c) Converging. (d) Parallel.
Same.	Median side of leg—foot to arch.	Diverging.	(a) Parallel to vicinity of ankle. (b) Diverging to arch.
Trunk.	Around neck.	No regularity.	(a) Diverging on dorsal side to vertebral prominence. (b) Converging.

(d) *Experiments with Other Observers.* We selected several regions for exploration with other observers. The only changes in these experiments were an increase (in some instances) of the number of tests for certain regions, and a greater variation of the aesthesiometer separations. The results are given in Tables VI-IX.

TABLE VI
EAR TO EAR, OVER LIPS

Obs.	No. cases	Distances	Summary of results
Be	6	25, 20, 30, 25, 35, 30	Diverging to center of lips. Illusion the same on both sides of face.
Bo	6	25, 20, 30, 25, 35, 30	1. Parallel to corner of lips. 2. Diverging to center of lips. Same on both sides.
J	30	20, 23, 18, 10, 20, 19, 23, 25, 25, 30, 19, 20, 30, 19, 18, 28, 27, 25, 26, 26, 25, 20, 23, 25, 30, 30, 20, 12, 18, 19	1. Gradually diverging to corner of lips. 2. Quickly diverging to center of lips. Illusion the same on both sides of the face.

TABLE VII
VOLAR SIDE OF ARM-HAND

Obs.	No. cases	Distances	Summary of results
Bo	6	35, 40, 30, 45, 35, 40	1. Parallel or diverging on upper arm. 2. Converging at elbow. 3. Diverging to wrist.* 4. Converging at base of hand. 5. Diverging to end, or diverging to mounds then converging, then diverging or parallel.†
D	25	35, 10, 30, 33, 30, 30, 31, 35, 30, 25, 20, 20, 10, 40, 25, 25, 10, 40, 30, 35, 15, 25, 20, 15, 25	1. Parallel on upper arm. 2. Slightly converging at elbow. 3. Gradually diverging to wrist. 4. Converging to palm. 5. Diverging to mounds. 6. Parallel to finger-tips.
R	25	35, 15, 20, 20, 30, 30, 25, 20, 30, 20, 15, 40, 35, 30, 39, 35, 36, 20, 40, 32, 35, 15, 30, 20, 33	1. Parallel on upper arm. 2. Slightly converging at elbow. 3. Gradually diverging to wrist, or parallel to wrist then diverging. 4. Converging to middle of palm. 5. Diverging to finger-tips.

* Twice, a divergence followed by a convergence occurred between elbow and wrist.

† Once, divergence at base of hand, then convergence to palm, and divergence to finger-tips.

TABLE VIII

OBSERVER C. TRUNK

Number of cases for every region, 6

Region explored	Distances	Summary of results
Across breast.	50, 55, 45, 55, 60, 55	1. Converging to right breast. 2. Diverging on right breast to nipple. 3. Converging, nipple to sternum, distance on sternum very small. Illusion same on left side.
Across back—left to right shoulder (lower part).	55, 60, 65, 50, 55, 50	1. Diverging to middle of left shoulder blade. 2. Converging to spine; distance here very small. Illusion same on right side.
Upper arm to hip— over volar side of arm, axilla, side.	45, 40, 45, 45, 50, 55	1. Parallel on arm. 2. Diverging on axilla. 3. Parallel. 4. Converging at waist.
Around neck.	25, 30, 30, 25, 20, 30	1. Parallel on ventral side; twice diverging slightly to, and converging from, median line.
		2. Diverging to, and from, vertebral prominence. Amount of divergence greater than in "1".

TABLE IX

OBSERVER BO. LEG-FOOT

Number of cases for each region, 6

Region explored	Distances	Summary of results
Dorsal side of leg: near top of upper to middle of lower.	65, 70, 60, 75, 70, 70	1. Parallel to point beyond knee-joint (twice, converging). 2. Slightly diverging to end.
Dorsal side of leg: middle of lower to toe.	30, 25, 40, 35, 30, 30	1. Parallel to near heel. (Once, divergence at beginning of ankle.) 2. Diverging to end. (Once, converging at instep: then diverging to end.)

A comparison of Tables VI-IX with Tables I-IV shows that, with the following exceptions, the illusions are the same for these observers as for G. (1) For Bo, the lines were parallel (instead of diverging) from ear to corner of lips; parallel (instead of converging) over knee-joint, dorsal side; and diverging (instead of parallel) over sole of foot. (2) For C, the paths were converging (instead of parallel) from side to breast, and parallel (instead of diverging and converging) over ribs from axilla to near waist. (3) For D, they were parallel (instead of diverging) on volar side of fingers. It will be noticed that in none of these cases is there a reversal of direction as regards convergence and divergence; and the general agreement of all observers, including Weber, bespeaks the stability of the illusion.

There is one respect, however, in which our results differ from Weber's; namely, in the effect on the illusion of two-point separations below the two-point limen. For example, Weber gives the value of the two-point threshold on the forearm as 40 mm. When the distances between the compass-points were from 16 to 25 mm., he found that the impression on the fore-arm was not that of two parallel lines but that of a single line which divided at the palm of the hand. When the distance was 40 mm., the impression was that of two parallel lines. In other words, the typical illusion fails in his case for distances considerably below the two-point limen.⁵ In our own experiments we have repeatedly employed distances on the fore-arm ranging from 10 to 40 mm., and we have never failed to obtain the illusion. Weber warns against what we now call the stimulus-error, and of course our observers were trained to avoid that. The only explanation we can offer for the difference of results is that Weber may have employed a pressure less than the 19.5 gr. of our experiments. We might perhaps expect the two-point limen for a moving stimulus to be less than that for an unmoved stimulus; but we know of no observations which cover this point.

B. The Influence of Various Conditions on the Illusion

The factors which we have investigated as conditioning the illusion are as follows: (a) the correspondence of certain of our qualitative results with differences of sensitivity in similar regions as measured by the two-point limen; (b) the continuity *vs.* the discontinuity of stimulation; (c) variation in the rate of movement of the stimulus; (d) the influence of visualization and eye-kinaesthesia on the illusion; (e) ease of localization of the stimulus, and variations in quality, intensity and clearness of the impressions; and (f) racial differences.

(a) *Correspondence between the Illusion at Certain Regions and Differences of Sensitivity at these Regions.* Vierordt has given sets of values showing differences of sensitivity at (1) the ventral-median line of head, neck, trunk, and leg; (2) the

⁵ E. H. Weber, *Ueber den Raumsinn*, 93 f.

dorsal-median line of the same parts; (3) the side line of the trunk; (4) the volar-side of the arm; and (5) the face. Weber has given detailed descriptions of variations in sensitivity of the cutaneous surface at various regions.⁶ We have utilised these descriptions by comparing them with our qualitative results. The following table shows the changes of the illusion as compared with changes in sensitivity.

TABLE X

Region	Changes in Illusion	Changes in Sensitivity	
		Weber	Vierordt
I Ear to ear over lips.	1. Gradually diverging to corner of lips (or parallel). 2. Quickly diverging from corner to centre of lips. Illusion same on both sides.	1. Progressively greater. 2. Prog. greater.	1. Progressively greater. 2. Prog. greater.
II Lower jaw; ear to ear.	1. Diverging from ear to tip of chin. Illusion same on both sides.	1. Prog. greater.	1. Prog. greater.
III Centre of lips to clavicle.	1. Converging.	1. Prog. less.	1. Approximately equal. 2. Prog. less.
IV Across breasts.	1. Parallel to right breast (or converging). 2. Diverging on right breast to nipple. 3. Converging to sternum. Illusion same on left breast.	1. Prog. greater. 2. Prog. greater. 3. Prog. less.	

⁶ K. Vierordt, *Physiologie des Menschen*, 1877, 343-349; Weber, *De pulsu resorptione auditu et tactu*, l. c.

TABLE X—*Continued*

Region	Changes in illusion	Changes in sensitivity	
		Weber	Vierordt
V Upper arm to hip; volar side of arm, axilla, side.	1. Parallel on upper arm. 2. Diverging (slightly G) on axilla. 3. Diverging over ribs (or parallel). 4. Converging to waist.	1. Small difference. 2. Greater sensitivity? 3. Prog. less.* 4. Prog. greater.*	3. (a) less.* (b) greater. 4. Less.
VI Ventral side of trunk; median line.	1. Parallel on upper sternum. 2. Slightly converging on lower sternum. 3. Then slightly diverging. 4. Converging, lower pelvic region.	1. Prog. greater.* 2. Prog. less. 3. Prog. greater. 4. Prog. less.	1. Approx. equal. 2. Less. 3. Approx. equal. 4. Approx. equal.
VII Lateral side of arm-hand.	1. Parallel, upper arm. 2. Diverging, elbow. 3. Parallel fore-arm (or slightly diverging to waist). 4. Diverging at waist. 5. Slightly converging, back of hand. 6. Slightly diverging, fingers.	1. Approx. equal. 2. Greater. 3. Approx. equal, to near wrist. 4. Greater (greater than 2). 5. Less. 6. Greater.	
VIII Volar side of arm-hand.	1. Parallel, upper arm. 2. Converging, elbow-joint. 3. Gradually diverging to wrist; sometimes parallel halfway to wrist. 4. Then slightly converging to palm. 5. Then diverging to finger tips; or parallel.	1. Approx. equal. 2. Greater.* 3. Approx. equal; greater at wrist (greater there than at elbow.) 4. Prog. less. 5. Prog. greater.	1. Approx. equal. 2. Approx. equal. 3. Prog. greater. 4. Approx. equal. 5. Prog. greater.

* The asterisks indicate a non-correspondence of divergence with greater, and convergence with less, sensitivity.

TABLE X—*Continued*

Region	Changes in illusion	Changes in sensitivity	
		Weber	Vierordt
IX Ventral side of leg-foot—middle of lower leg, over foot.	1. Parallel to vicinity of ankle. 2. Diverging over ankle 3. Then slightly converging at instep. 4. Then, gradually diverging.	1. Approx. equal. 2. Greater. 3. Less. 4. Prog. greater.	1. Approx. equal. 2. Approx. equal. 3. Prog. greater.* 4. Prog. greater.
X Dorsal side of leg-foot—middle of lower leg, over heel and sole.	1. Fairly parallel to vicinity of ankle. 2. Then diverging to near tip of heel. 3. Then, parallel or diverging over sole.	1. Approx. equal. 2. Prog. greater. 3. Prog. less* to arch; then progressively greater to toes.	
XI Lateral side of leg-foot.	1. Parallel on upper leg. 2. Diverging, knee-region. 3. Parallel twice, parallel to only one-half or two-thirds distance to ankle, then gradually diverging. 4. Diverging over ankle 5. Then slightly converging. 6. Then gradually diverging on sole.	1. Approx. equal. 2. Greater. 3. Approx. equal. 4. Greater. 5. Less. 6. Equal?*	
XII Median side of leg-foot—middle of lower leg, over ankle and sole.	1. Parallel to vicinity of ankle. 2. Gradually diverging to sole. 3. Parallel.	1. Approx. equal. 2. Greater (then less?) 3. Approx. equal.	

* The asterisks indicate a non-correspondence of divergence with greater, and convergence with less, sensitivity.

It was Weber's belief that the illusion is directly conditioned upon change in sensitivity of the cutaneous surface. "Sie [die Bahnen] scheinen an den Teilen der Haut zu divergieren, wo die Hauttheile auf feiner fühlende übergehen, sie scheinen dagegen dann zu convergieren, wenn sie von feiner fühlenden Hauttheilen auf stumpfer fühlende übergehen." This position has been questioned by Lichtenfels, Wundt and Judd.⁷ Wundt lays it down as a general rule that the perception of local differences and the estimation of the distance between two impressions are independent; the illusion is therefore conditioned upon other factors. Judd bases his objection on results obtained by Camerer, who found, by the method of equivalents, that the same separations were occasionally judged as equal when the points were placed upon cutaneous surfaces of different sensitivity. Our results show however, that, with eight exceptions, an increase in sensitivity (according both to Weber and to Vierordt) corresponds with a divergence, a decrease with a convergence, while an "approximately equal" may correspond with divergence, convergence, or parallelism. This latter equivocal correspondence, taken together with the eight exceptions, points to other determining factors in the illusion, which we shall discuss later.

(b) *Continuity vs. discontinuity of movement.* Wundt mentions continuous movement of the stimulus as a condition of the illusion. This factor we have attempted to investigate as follows. We selected regions (explored in previous experiments) where the illusion was well defined; and we moved the stimulus over such a region, first continuously, and then after an interval of one second discretely, the stimulus being now moved for a short distance only over those places where the earlier results indicated a change in direction of the paths. The observers were instructed in both cases to report the impression perceived. We give a summary of the results of the discontinuous series in Table XI.

The table shows (1) that with discontinuous stimuli the illusion of converging and diverging paths practically never occurs; we find instead a series of short parallel paths which vary in amount of separation; and (2) that the relative magnitudes of the distances between the paths at the places of change are similar with discontinuous and with continuous movement. Where the continuous stimuli yield a convergence,

⁷ E. H. Weber, *Ueber den Raumsinn*, 93; R. Lichtenfels, *Sitzungsber. d. W. Akad.*, vi, 1851, 348 f.; W. Wundt, *Grundzüge*, ii, 1910, 465; C. H. Judd, *Philos. Stud.*, xii, 1896, 457; W. Camerer, *Zeit. f. Biol.*, xxiii, 1886, 509.

TABLE XI

Obs.	Region	Places of change on region	Results with Discrete Stimuli
Bo	I. Ear to ear over lips.	a b c d e	Paths parallel. Same, but distance less than at a. Same, but distance less than at b. Same, but distance less than at c. Same but distance equal to d.
	II. Volar side of arm-hand.	a b c d e	Paths parallel. Same, but distance less than at a. Same, but distance greater than at b.* Same, but distance less than at c. Same, but distance greater than at d.
	III. Dorsal side of leg near top of upper to middle of lower.	a b c	Paths parallel. Same, but distance less than at a. Same, but distance greater than at b.
	IV. Dorsal side of leg-foot; middle of lower leg to toes.	a b c	Paths parallel. Same, but distance greater than at a. Same, but distance greater than at b.
	V. Across breasts.	a b c	Paths divergent.† Paths parallel, but distance greater than a. Same, but distance less than at b.
	VI. Across back.	a b c	Paths parallel. Same, but distance greater than at a. Same, but distance less than at b.
C	VII. Upper arm to hip, —over volar side of arm, axilla, side.	a b c d	Paths parallel. Same, but distance greater than at a. Same, but distance less than at b. Same, but distance less than at c.
	VIII. Neck.	a b	Paths parallel. Same, but distance less than at a.

*Twice not parallel; (1) diverging, (2) diverging then converging.

† The discontinuous distances on this region were reported as very difficult to judge. Sometimes no judgments could be given, or only doubtful ones.

there the distance between the parallel paths is less than that at the preceding place in a region; and, conversely, where they yield a divergence, the distance is greater.

It appears, then, that short movements on the skin are sufficient for a perception of direction and relative distance, but that they do not permit the perception of a change in the direction of movement. This result is perhaps conditioned, in part at least, upon the fact, first observed by Hall and Donaldson,⁸ that a moving point on the skin must traverse a certain distance before a judgment of direction can be given. Since the points were put down near the place of change, the relative direction of the two paths would naturally be perceived as parallel; and before a change could be discriminated, the movement came to an end.

(c) *Variation in Rate of Movement of the Two-point Stimuli.* The authors who discuss the illusion do not agree as regards the optimal rate of movement. Halliburton and Ladd say that the compasses should be moved slowly, Schaefer 'with sufficient speed,' and Wundt, quickly.⁹ We repeated the experiment with two observers and at various regions with the following rates (cm. per sec.): 1.56, 3.13, 12.5 and 25. Since in the majority of our experiments we employed the rate of 6.25 cm. per sec, we can compare our former results with those of the new rates. We give the latter in Table XII.

It will be seen that none of the four rates employed in this group of experiments gives the illusion as consistently as the rate of 6.25 cm. per sec. There is also a rather wide individual variation. With the fastest rate Bo did not obtain the illusion; and at the other extreme, although the illusion was more marked, new variations appeared. C, on the other hand, finds the faster rate more favorable to the illusion than the slower. The fact that both observers find numerous irregularities, smaller convergences and divergences, etc., with the very slow rate, seems to suggest that some other factors which as a rule are not functioning in the illusion, such, *e.g.*, as differences in quality or of distinctness of impression, or perhaps visual imagery, may be operative. We return to this point later.¹⁰

(d) *Effect of Visualization: Experiments with Blind Observers.* All our observers reported that eye-movement and

⁸ G. S. Hall and H. H. Donaldson, *Motor Sensations of the Skin, Mind*, x, 1885, 563 ff.

⁹ W. D. Halliburton, *Handbook of Physiology*, 1911, 766; G. T. Ladd, *Elements of Physiological Psychology*, 1892, 406; E. A. Schaefer, *Textbook of Physiology*, 1911, 943; W. Wundt, *loc. cit.*

¹⁰ See pp. 118 f.

visual imagery were usually, if not invariably, present, in the perception of the illusion. Attempts under instruction to inhibit both kinaesthesia and imagery failed; partly because the effort itself failed, partly because the inhibition served as a distraction from the perception of the illusion. Only in one instance, when the *O* was allowed with open eyes to fixate an object, was there a pure tactual perception of moving points. The experience was not clear, however, and the direction and localization were indefinite.

TABLE XII
OBSERVER BO. INFLUENCE OF VARIOUS RATES OF MOVEMENT

Regions ex- plored	Rates in cm. per sec.			
	25	12.5	3.13	1.56
I Ear to ear over lips.	Practically parallel; slight diver- gence to centre of lips.	Practically parallel; very slight divergence to centre of lips.	More marked? also paths bulged on centre of cheeks.	More marked; also paths bulged on centre of cheeks.
II Volar side of arm- hand.	Approximately parallel; a slight diver- gence near wrist; some variation on palm; slight convergence at elbow.	As average.	As average except no convergence at elbow.	More marked. Also, there were besides the usual con- vergences and divergences many smaller ones, succeed- ing each other incessantly.
III Dorsal side of leg— near top of upper to mid- dle of lower.	Practically parallel.	As average.	As average.	More marked. Once, an extra divergence and convergence on lower leg.
IV Dorsal side of leg— middle of lower leg to toes.	Practically parallel.	As average.	More marked; extra changes noted: (1) con- vergence just below ankle; (2) conver- gence at instep.	More marked; two extra changes noted as with the faster rate.

OBSERVER C

I Across breasts	As average.	As average.	As average.	Paths crossed and recrossed (in one experiment 15 times); no regularity about the crossing or about the variations of distance.
II Across back—left to right shoulder (lower part.)	As average; but the maximal distances and minimal distances come too soon, i.e., a displacement of illusion to the right.	As average.	In general, as average; sometimes the upper path seemed to pass over into the lower.	Illusion different with no regularity; also crossing of the paths.
III Upper arm to hip—over volar side of arm, axilla, side.	As average.	As average.	As average.	Same as for back region.
IV Neck	As average	As average	Practically parallel.	Practically parallel.

In the hope of obtaining some indication of the bearing of visualization upon the illusion, we performed a number of experiments with four congenitally blind observers: H. Coover (Co), R. Hudson (H), B. Lowe (L), and H. Stitt (S). All were of high-school age, pupils of the Ohio State Institution for the Blind; the experiments were performed at Columbus. The conditions of the experiment were the same in every respect as those in the Cornell laboratory, except that twelve observations were taken, instead of the usual six. All observers were given preliminary experiments with both single and double points, and with instructions to describe the experience. When they had become accustomed to the situation, the experiments proper were begun. We give a summary of the results in Table XIII.

TABLE XIII

Obs.	Region explored	Distances used (in mm.)	Summary of results
Co.	Volar side of arm-hand (left).	35, 45 40, 40 45, 45 40, 40 35, 35 40, 40	1. Parallel on upper arm, 8 times; diverging, 3 times. 2. Converging at elbow, 5 times; converging to diverging, each, 3 times. 3. Diverging on lower arm, 6 times; parallel, 3 times; converging, 2 times. 4. Diverging on wrist, 7 times; parallel, 4 times. 5. Parallel on hand, 6 times. 6. Parallel on finger, 8 times.
H.	Volar side of arm-hand (left).	35, 45 40, 40 45, 45 40, 40 35, 35 40, 45	1. Parallel on upper arm, 7 times; parallel then converging, 4 times. 2. Converging at elbow, 6 times; parallel, 5 times. 3. Parallel, then converging, 5 times; parallel, 4 times. 4. Parallel on wrist, 6 times; diverging, 6 times. 5. Parallel on hand, 7 times; diverging, 4 times. 6. Parallel on fingers, 10 times.
L.	Volar side of arm-hand (left).	35, 45 40, 40 45, 45 40, 40 35, 35 40, 45	1. Converging on upper arm, 7 times; parallel; 3 times. 2. Converging at elbow; 9 times; diverging; 3 times. 3. Diverging on lower arm, 6 times; converging, 6 times. 4. Diverging on wrist, 6 times; converging, 6 times. 5. Converging on hand, 5 times; diverging, 4 times. 6. Diverging on fingers, 5 times; converging, 4 times.
S.	Volar side of arm-hand (left).	35, 40 40, 30 45, 35 40, 30 30, 35 40, 30	1. Parallel on upper arm, 12 times. 2. Converging at elbow, 6 times; parallel, 4 times. 3. Parallel on lower arm, 6 times; converging and diverging, 2 times each. 4. Parallel on wrist, 7 times; diverging, 3 times; converging, 2 times. 5. Parallel on hand, 6 times; diverging, 5 times; converging, 1. 6. Parallel on fingers, 6 times; diverging 4 times.

If we regard the perception of change of direction and relative distance of the two paths as the essential mark of the illusion, we must conclude that the congenitally blind may experience the illusion, and that visualization is not a necessary component of the perceptive pattern in the normal individual. The differences between the reports of the two types of observer show, nevertheless, that the change in direction is much less frequent in the blind, and that there are greater inconsistencies not only between reports of single observers, but also between observations of different observers. We must suppose that visualization lends greater facility to the perception of relative direction and distance on the skin, and thus to the perception of change in direction of the cutaneous paths.

(e) *Ease of Localization and Variations of Intensity and Clearness, and of Quality, of the Cutaneous Impressions at Various Places.* Lichtenfels, Wundt and Judd, who, as we have already seen, do not accept Weber's explanation of the illusion, suppose that it is conditioned upon differences in degree of distinctness (*Deutlichkeit*) of the impression at various points of its course.¹¹ We have, accordingly, performed experiments in which we asked two observers to report differences of ease of localization, of intensity and clearness, and of quality. These terms were meant to be taken in a rough, everyday sense; we hoped only to find characterizations of experience which might be parallel to the course of the illusion. Observer C, however, was unable to give reports of quality in any other than its attributive sense, and failed, therefore, to find any qualitative differences. A summary of the reports of the two observers will be found in Table XIV.

A comparison of Table XIV with Tables I-IX shows that, as a general rule, a change in ease of localization corresponds with a change in the course of illusion; that less-to-greater ease is correlated with a divergence, and greater-to-less ease with a convergence. Furthermore, an increase in intensity and clearness of the experience is in general correlated with a divergence, and a decrease with a convergence. Finally, in the case of one observer, we frequently find a change in quality correlated with a change in the direction of the illusion. This observer reported also that the clearness of the visual images accompanying the impression varies directly with the clearness of the pressure sensations. There are, however, exceptions to the rules. Observer C found no difference in ease of localization across the breasts, and she found the most

¹¹ See p. 97.

TABLE XIV

OBSERVER Bo.

Region explored	Localization	Intensity and clearness	Quality
I. Ear to ear, over lips.	1. Easiest over lips.	1. Most intense and clear over lips. 2. Then, corner of mouth. 3. Then cheek.	1. "Brighter," "larger" over mouth. Over solid structures a perception of hardness. Over soft structures a perception of softness.
II. Volar side of arm-hand.	1. Easiest on fingers. 2. Then (nearly as easy), palm and wrist. 3. Then, elbow-joint. 4. Then, lower part of forearm. 5. Then, upper part of forearm. 6. Then upper arm.	1. In general, most intense and clear on elbow-joint, beginning of hands, transition from hand, to fingers; and 2. Less intense and clear on arm than hand. 3. Particularly clear at bumpy places and elbow-joint.	1. "Granular, thick" on elbow-joint ("like knee-joint"). 2. "Big, granular" on hand, wrist ("like ball of foot"). 3. "Diffuse, flat, thin," on upper arm ("like that on upper leg"). 4. Quality intermediate between "1" and "3" on forearm.
III. Dorsal side of leg,—near top of upper to middle of lower.	1. Easiest on knee-joint. 2. Then, calf. 2. Then, upper leg.	1. Most intense and clear on knee-joint. 2. Then, lower leg. 3. Then, upper leg.	1. "Granular, thick" on knee-joint. 2. "Diffuse, flat" on upper leg. 3. Quality intermediate between "1" and "2" lower leg.
IV. Dorsal side of leg,—middle of lower to toes.	1. Easy, from ankle to instep. 2. Difficult on leg and near instep.	1. Most intense and clear on sole. 2. Then, heel (nearly equal to "1"). 3. Then, leg.	1. "Much bigger, more granular" on sole and more apt to set up tickle. 2. Then, on leg.

TABLE XIV—*Continued*
OBSERVER C

Region explored	Localization	Intensity and clearness
I. Across breasts.	No differences.	1. Most intense and clear on sternum. 2. Then, sides. 3. Then, breasts.
II. Across back—left to right shoulder (lower part).	Easy all the way.	Doubtfully the same all the way across.
III. Upper arm to hip—over volar side of arm, axilla, side.	1. Easiest on arm. 2. Then, near wrist. 3. Least easy at end of axilla.	1. Most intense and clear on arm. 2. Then, sides. 3. Then, axilla.
IV. Neck.	1. Easiest at vertebral prominence. 2. Then, Adam's apple. 3. Then, side.	1. Most intense and clear at vertebral prominence. 2. Gradually less intense and clear to sides. 3. Same across ventral part.

intense and clear experience on the sternum (where the illusion shows a convergence) and a less clear impression on the breasts (where the illusion shows a divergence). Moreover, in the region across the back, this observer found no difference in ease of localization and in degree of clearness at any point in the illusion. Taking the results as a whole, however, the correlation of ease of localization and degree of intensity and clearness with change in the direction of the paths is about the same as the correlation of the latter with change in degree of sensitivity. The issue between Wundt and Weber must, therefore, be settled on other grounds. We reserve the discussion of this point until we come to consider our results as a whole.

(f) *Racial Differences.* We undertook some experiments with two colored observers, the one (Ca) a negress, the other (M) a mulatto. We explored the same regions as those chosen for more detailed study in our other experiments; and we employed the same procedure throughout, except that we doubled the number of observations for a region. Despite the fact that we gave preliminary series before the experiments proper began, the results were not satisfactory. Not only do the reports differ materially from those of other observers (with the exception of the ear-to-lip illusion), but there is also so little uniformity that a conclusion regarding racial differences is impossible. We append, however, in Table XV sample results for two regions for each observer.

TABLE XV
OBSERVER CA.

Region	Distances	Summary of results
Ear to ear over lips.	30, 30, 25, 20, 25, 30, 30, 25, 30, 25, 30, 25	1. Parallel to corner of lips but converging just at corner, 4 times. 2. Diverging to centre of lips. 3. Parallel to ear, but 3 times diverging toward the ear.
Volar side of arm-hand to finger-tips.	40, 45, 35, 40, 35, 40, 40, 45, 40, 35, 40, 45	1. Parallel on upper arm. 2. Converging at elbow. 3. Diverging halfway to wrist. 4. Converging to near wrist. 5. Diverging over wrist to palm. 6. Converging from palm to finger-tips 7 times, diverging 3 times, parallel 2 times.

OBSERVER M.

Ear to ear over lips.	30, 25, 20, 35, 30, 30, 25, 30, 25, 35, 30, 25.	1. Parallel at beginning. 2. Diverging on cheek. 3. Then converging to corner of lips. 4. Diverging to centre of lips. Illusion in reverse order on other side.
Volar side of arm-hand to finger-tips.	35, 40, 35, 30, 40, 40, 35, 40, 35, 30, 35, 40	1. Usually parallel on upper arm either for a short distance, or to elbow, or to beyond elbow. If parallel only part of the distance, then converging to elbow. Sometimes diverging on upper arm. 2. Diverging over elbow to center of forearm; only once converging at elbow joint. 3. Then, converging. 4. Then diverging over wrist. 5. Converging over base of hand. 6. Diverging over palm. 7. Converging at mounds. 8. Parallel, converging, or diverging over fingers.

C. Summary of Qualitative Results

We have found (1) that Weber's illusion occurs in some form in most regions of the body, and that any one form is fairly constant for normal observers. (2) In our study of the various conditions of the illusion we have found (a) that there is a high correlation between change in direction of the paths and degree of sensitivity as measured by Weber and Vierordt; (b) that the characteristic convergence and divergence of the paths do not appear unless the movement of the stimulus is continuous; (c) that rates of movement above 12.5 and below 3.13 cm. per sec. are not adequate to the illusion for all observers; (d) that congenitally blind individuals may experience the illusion, so that the visualization which is common for normal observers is not a necessary component of the perceptive pattern; (e) that there is a high correlation between places of change in the illusion and ease of localization and variation of intensity and clearness of the cutaneous impressions at these places; and (f) that experiments with two observers of the negro race do not admit of any conclusion with regard to racial difference. Since in our quantitative study we shall find additional facts of importance for an understanding of the illusion, we shall defer a general discussion until we have considered the quantitative results.

III. QUANTITATIVE EXPERIMENTS

A. Introduction. The second part of our investigation was a quantitative study of the illusion by the method of equivalents. We sought to discover whether the subjective equation of two cutaneous extents, at places where change of direction in the illusion had been reported, would yield results that could be correlated with the direction of change in the illusion as qualitatively described. There is, it is true, no guarantee that the attitude of judging the relative magnitudes of two cutaneous extents is the same as that of observing relative changes in direction of two moving paths. But, on the other hand, there is no guarantee that the two attitudes are not similar. We ought, therefore, to gain further insight into the psychology of the illusion, regardless of the positive or negative outcome of our quantitative results.

B. Method. The form of the method employed was that laid down by Titchener.¹² As a rule, five points (A, B, C, D, E) were selected, every one of which represented a place of change in the illusion. A standard distance was chosen which was supraliminal for the region.

¹² E. B. Titchener, *Experimental Psychology*, 1905, i, 77 ff; ii, 187 ff.

This standard was first placed at A, and the equivalent values were found for AB, AC, AD, AE. This group we shall call the A group. We then took the equivalent value for B, and employed it as a standard in the B group; i.e., we obtained the equivalent values for BC, BD, BE. We then took the value for C, found in the A group, and determined the equivalent values for CD and CE. Finally, we took the value for D found in the A group, and obtained the equivalent values for DE. All of the standards except the first were taken from the first space-order. Each time-order contained ten series, five ascending and five descending, so that each space-order contained in all twenty series, making forty series in the total experiment. The instrument employed was the Griesbach aesthesiometer with the same points of hard rubber and with the same amount of pressure as in our qualitative experiments. At the beginning of every series there were two signals, 'ready,' and 'now,' only one of these, 'now,' was used for the applications of the stimulus within a series. The interval between the 'ready' and 'now' was two sec.; the duration of a stimulation, one sec.; the interval between stimulations, one sec.; and that between series, about four secs.

C. The Regions Examined. (1) *From Lips to Ear.* Since the course of the illusion was the same on both sides of the face, we applied the method of equivalents to the left side only. According to our plan, the following places were chosen: A, center of lips; B, half-way between the centre and corner of lips; C, corner of lips; D, half-way between corner and ear; E, 1 cm. from ear. The observers for this region were E. G. Boring (B) and Miss F. A. Bean (Be). (2) *From Top of Upper-arm to Finger Tips (volar side).* The places of change were: A, upper-arm, two-thirds distance from axilla to elbow; B, elbow-joint; C, wrist; D, palm (near mounds); E, finger-tips. In working on the fingers, when it was impossible to use large separations of the points on the two middle fingers, we had recourse to the first and third fingers. The standard distance was 40 mm. (for M, 35 mm.). There were five observers, B, Bo, Ca, D and M. (3) *Volar Side of Upper Arm, Axilla and Side to Hip.* Only four places were chosen in this region: A, upper arm (11 cm. above elbow); B, axilla; C, ribs (16 cm. from axilla); D, waist (10 cm. below C). The observers were Miss E. Alspach (A) and E. The latter, however, completed only the A group. The standard distance was 55 mm. (4) *From Sternum over Left Side of Trunk, Shoulder to Spine.* The five places were: A, sternum; B, middle of left breast; C, left side; D, shoulder, one-half distance between the side and spine; E, spine. The observers were C and W. S. Foster (F). The standard distance was 55 mm. (5) *Dorsal Side of Leg-foot, Upper Leg to Heel, over Sole to Toes.* The points selected were: A, upper leg, two-thirds distance from knee to buttocks; B, knee-joint; C, lower leg (15 cm. from knee); D, near ankle (11 cm. from tip of heel); E, sole of foot (5 cm. from the first toe). The observers were A and E. The standard distance for A was 55 mm., for E 70 mm. (55 mm. was too small a distance to give a perception of two points).

D. The Results. In Tables XVI-XX we give the equivalence ratios for every point examined in every group of the five regions. We also give the principal errors for each of the two space-orders, and the two time-errors for each of the two space-orders. The former is the difference between the

standard and the average of the two equivalent values found for each time-order. This value may, therefore, be taken as the measure of the illusion in relation to the standard of its group. In these errors the minus sign means that the equivalent value was less than the standard; in the time-errors the same sign means that the value of the first is less than that of the second time-order.

In Table XXI we give the quotients not only of all ratios found by experiment in every group (first space order), but also those computed from the ratios of earlier groups. *E.g.*, in the B group the computed value (C) of b/c is the reciprocal of a/b over b/c of the A group. In the C group there are two computed values, the first from the A, the second from the B group. The degree of approximation of the computed to the found quotients for any ratio offers a measure of the reliability both of the observer and of the method.

TABLE XVI
EQUIVALENCE FOR FIVE POINTS—LIPS TO EAR

Observer B.	Principal errors		Time errors	
	I	II	I	II
a and b 30.0 : 29.6 :: 28.9 : 30.0	-0.4	-1.1	-0.7	-1.1
a and c 30.0 : 31.2 :: 28.6 : 30.0	+1.2	-1.4	-2.5	-0.7
a and d 30.0 : 38.8 :: 20.4 : 30.0	+8.8	-9.6	-0.1	-0.6
a and e 30.0 : 36.7 :: 21.8 : 30.0	+6.7	-8.2	-1.4	-2.2
b and c 29.6 : 31.1 :: 26.7 : 29.6	+1.5	-2.9	-2.8	-0.9
b and d 29.6 : 39.3 :: 16.1 : 29.6	+8.2	-13.5	-0.5	-1.35
b and e 29.6 : 37.1 :: 16.3 : 29.6	+7.5	-13.3	-0.5	-0.2
c and d 31.2 : 36.7 :: 22.3 : 31.2	+5.5	-8.65	-1.1	+1.5
c and e 31.2 : 35.2 :: 23.5 : 31.2	+4.0	-7.7	-1.0	-0.9
d and e 38.8 : 38.5 :: 36.9 : 38.8	-0.25	-1.85	-0.35	-0.95
Observer Be.				
a and b 30.0 : 31.7 :: 27.7 : 30.0	+1.75	-2.3	-0.45	+1.0
a and c 30.0 : 34.3 :: 28.4 : 30.0	+4.35	-1.6	-2.15	-1.9
a and d 30.0 : 37.0 :: 17.6 : 30.0	+7.0	-12.4	+0.85	-1.4
a and e 30.0 : 40.6 :: 17.9 : 30.0	+10.6	-12.1	-0.55	0.0
b and c 31.7 : 34.4 :: 24.2 : 31.7	+2.6	-7.5	-0.85	+0.5
b and d 31.7 : 39.5 :: 16.9 : 31.7	+2.7	-14.9	-1.0	+0.12
b and e 31.7 : 43.4 :: 20.4 : 31.7	+11.6	-11.4	-0.67	-1.6
c and d 34.3 : 45.4 :: 23.5 : 34.3	+11.0	-10.8	-1.15	-1.2
c and e 34.3 : 43.5 :: 21.5 : 34.3	+9.1	-12.8	-1.0	-2.25
d and e 37.0 : 36.4 :: 39.5 : 37.0	-0.67	+2.45	-0.31	-1.75

(Only four series in a time-order for groups B, C, and D.)

TABLE XVII
EQUIVALENCE FOR FIVE POINTS—VOLAR SIDE OF ARM-HAND

Observer Bo.	Principal errors		Time errors	
	I	II	I	II
a and b 40.0 : 45.0 :: 33.4 : 40.0	+5.0	-6.5	-2.7	-2.85
a and c 40.0 : 29.4 :: 51.7 : 40.0	-10.55	+11.7	-3.6	-5.85
a and d 40.0 : 27.2 :: 51.2 : 40.0	-12.8	+11.2	-2.4	-1.05
a and e 40.0 : 22.2 :: 52.4 : 40.0	-17.7	+12.4	-1.0	-2.3
b and c 45.0 : 32.6 :: 62.0 : 45.0	-12.4	+17.0	-0.1	-0.25
b and d 45.0 : 23.5 :: 56.2 : 45.0	-21.5	+20.2	-1.5	-1.25
b and e 45.0 : 13.4 :: 57.7 : 45.0	-13.4	+12.7	-0.1	-1.25
c and d 29.4 : 29.4 :: 30.1 : 29.4	0.00	+0.7	-0.85	-2.12
c and e 29.4 : 27.1 :: 36.1 : 29.4	-2.32	+6.7	-0.6	-1.37
d and e 27.2 : 19.7 :: 32.4 : 27.2	-7.45	+5.2	-0.5	+0.37
Observer Ca.				
a and b 40.0 : 44.1 :: 37.0 : 40.0	+4.1	-2.95	0.00	+0.55
a and c 40.0 : 29.1 :: 50.2 : 40.0	-10.9	+10.2	-0.12	-1.1
a and d 40.0 : 15.4 :: 53.1 : 40.0	-15.4	+13.1	-3.5	-0.5
a and e 40.0 : 13.6 :: 53.9 : 40.0	-13.6	+13.9	-0.45	-1.35
b and c 44.1 : 24.9 :: 58.2 : 44.1	-19.1	+14.1	+0.45	+1.65
b and d 44.1 : 20.1 :: 54.3 : 44.1	-24.0	+10.2	+2.8	+1.0
b and e 44.1 : 25.5 :: 54.0 : 44.1	-18.6	+9.9	-1.35	-0.25
c and d 29.1 : 33.7 :: 22.3 : 29.1	+4.6	-6.7	-1.9	-0.65
c and e 29.1 : 23.9 :: 34.6 : 29.1	-5.2	+5.5	+0.3	-1.65
d and e 24.6 : 18.1 :: 32.4 : 24.6	-6.4	+7.8	+0.95	-1.45
Observer D.				
a and b 40.0 : 37.0 :: 40.1 : 40.0	-3.0	+0.1	-3.2	-1.0
a and c 40.0 : 21.7 :: 39.8 : 40.0	-19.3	+0.1	-2.3	-4.4
a and d 40.0 : 26.9 :: 45.5 : 40.0	-13.1	+4.45	-5.0	-2.5
a and e 40.0 : 15.5 :: 46.3 : 40.0	-25.5	+3.6	-1.4	-1.85
b and c 37.0 : 26.7 :: 55.5 : 37.0	-10.25	+18.3	-0.35	-1.55
b and d 37.0 : 23.2 :: 58.6 : 37.0	-13.8	+21.6	+0.05	-0.3
b and e 37.0 : 17.0 :: 51.7 : 37.0	-20.0	+14.7	-1.8	-1.4
c and d 21.7 : 18.8 :: 24.5 : 21.7	-2.9	+2.8	0.00	+0.05
c and e 21.7 : 12.1 :: 31.8 : 21.7	-9.6	+10.1	-0.6	-1.1
d and e 15.5 : 13.8 :: 23.1 : 15.5	-1.7	+7.6	-1.0	-0.9

TABLE XVII—Continued
EQUIVALENCE FOR FIVE POINTS—VOLAR SIDE OF ARM-HAND

Observer B.					
a and b	40.0 : 46.9 :: 33.7 : 40.0	+6.95	—6.25	—3.15	—0.85
a and c	40.0 : 22.6 :: 51.0 : 40.0	—17.4	+11.0	—1.1	—2.1
a and d	40.0 : 24.6 :: 60.1 : 40.0	—15.3	+20.1	—1.85	—1.85
a and e	40.0 : 19.0 :: 60.2 : 40.0	—21.0	+20.2	—2.7	+0.3
b and c	46.9 : 31.7 :: 61.9 : 46.9	—15.2	+14.9	—1.5	—2.12
b and d	46.9 : 33.1 :: 56.3 : 46.9	—13.8	+9.4	—1.12	—0.12
b and e	46.9 : 22.4 :: 60.0 : 46.9	—24.6	+13.0	—0.6	+0.5
c and d	22.6 : 17.2 :: 31.2 : 22.6	—5.4	+8.6	+0.5	—0.25
c and e	22.6 : 11.5 :: 33.2 : 22.6	—11.1	+10.6	+0.5	+0.75
d and e	24.6 : 23.9 :: 33.7 : 24.6	—0.8	+9.1	—1.37	0.00
Observer M.					
a and b	35.0 : 40.0 :: 30.8 : 35.0	+5.0	—4.2	—0.2	+0.5
a and c	35.0 : 27.4 :: 41.6 : 35.0	—7.6	+6.6	—0.9	—0.55
a and d	35.0 : 24.6 :: 41.1 : 35.0	—10.3	+6.1	—0.65	—2.95
a and e	35.0 : 22.5 :: 47.0 : 35.0	—12.4	+12.0	+1.35	—1.2
b and c	40.0 : 34.0 :: 48.6 : 40.0	—6.0	+8.6	—1.5	—3.35
b and d	40.0 : 29.0 :: 45.7 : 40.0	—10.9	+5.7	—0.45	—1.2
b and e	40.0 : 26.1 :: 54.4 : 40.0	—13.9	+14.4	—2.0	—3.8
c and d	27.4 : 24.8 :: 32.5 : 27.4	—2.6	+5.1	—1.1	—0.9
c and e	27.4 : 16.2 :: 36.3 : 27.4	—11.2	+8.9	—0.3	—0.85
d and e	24.6 : 17.1 :: 29.9 : 24.6	—17.5	+5.2	+1.3	—0.6

TABLE XVIII
EQUIVALENCE FOR FOUR POINTS—VOLAR SIDE OF UPPER ARM,
AXILLA, SIDE

Observer A		Principal errors		Time errors	
		I	II	I	II
a and b	55.0 : 44.0 :: 64.6 : 55.0	—10.9	+9.6	—7.35	—1.15
a and c	55.0 : 36.0 :: 68.4 : 55.0	—19.0	+13.4	0.00	—1.25
a and d	55.0 : 32.5 :: 64.3 : 55.0	—22.4	+9.3	—3.15	—1.45
b and c	44.0 : 53.7 :: 43.4 : 44.0	+9.6	—0.65	—1.6	—0.3
b and d	44.0 : 46.2 :: 34.1 : 44.0	+2.1	—9.9	+1.3	—3.6
c and d	36.0 : 34.0 :: 40.1 : 36.0	—1.9	+4.1	—0.25	—4.6
Observer E.					
a and b	55.0 : 45.38 :: 65.0 : 55.0	—9.62	+10.0	—0.12	—1.00
a and c	55.0 : 24.12 :: 77.13 : 55.0	—30.87	+22.13	—0.85	—1.62
a and d	55.0 : 37.88 :: 62.75 : 55.0	—17.12	+7.75	—3.62	0.00

TABLE XIX
EQUIVALENCE FOR FIVE POINTS—BREAST AND BACK

Observer C.	Principal errors		Time errors	
	I	II	I	II
a and b 55.0 : 57.9 :: 39.8 : 55.0	+2.9	-15.1	-9.3	-5.35
a and c 55.0 : 65.6 :: 41.9 : 55.0	+10.6	-13.0	-14.7	-5.95
a and d 55.0 : 73.8 :: 38.6 : 55.0	+18.8	-16.3	-4.15	-7.45
a and e 55.0 : 74.9 :: 37.2 : 55.0	+19.9	-17.7	+1.15	-4.25
b and c 57.9 : 50.3 :: 83.0 : 57.9	-7.5	+25.1	-4.05	-2.9
b and d 57.9 : 91.5 :: 58.9 : 57.9	+33.6	+1.0	+3.85	-1.5
b and e 57.9 : 69.4 :: 63.2 : 57.9	+11.5	+5.3	-0.85	+0.5
c and d 65.6 : 62.6 :: 78.2 : 65.6	-3.0	+12.5	+4.85	-1.9
c and e 65.6 : 69.6 :: 74.0 : 65.6	+4.0	-8.4	-2.15	-4.5
d and e 73.8 : 88.7 :: 63.2 : 73.8	+14.9	-10.6	+0.75	-1.1
Observer F.				
a and b 55.0 : 37.95 :: 68.55 : 55.00	-17.05	+13.5	+2.25	-0.05
a and c 55.0 : 74.30 :: 42.65 : 55.00	+19.3	-12.35	-2.6	-1.35
b and c 37.9 : 56.40 :: 30.55 : 37.90	+18.45	-7.4	-0.5	+5.55
c and d 74.3 : 48.20 :: 85.55 : 74.30	-3.95	+11.25	+3.5	+8.65
d and e 78.2 : 86.40 :: 76.05 : 78.25	+8.15	-2.20	+1.3	+2.65

TABLE XX
EQUIVALENCE FOR FIVE POINTS—DORSAL SIDE OF LEG-FOOT

Observer A.	Principal errors		Time Errors	
	I	II	I	II
a and b 55.0 : 58.9 :: 63.1 : 55.0	+3.9	+8.15	+0.85	+0.35
a and c 55.0 : 40.3 :: 62.1 : 55.0	-14.6	+7.1	+2.15	-2.2
a and d 55.0 : 18.9	-37.0	.....	+0.75	.....
a and e 55.0 : 26.5 :: 84.3 : 55.0	-28.4	+29.3	-0.65	+0.25
b and c 58.9 : 53.8 :: 64.3 : 58.9	-5.1	+5.3	+2.05	+0.5
b and d 58.9 : 17.4	-41.5	.....	-1.44	.....
b and e 58.9 : 31.3 :: 80.5 : 58.9	-27.6	+21.5	+0.1	-0.5
c and d 40.3 : 25.2	-15.1	.....	+0.65	.....
c and e 40.3 : 37.1 :: 79.5 : 40.3	-3.2	+39.1	+1.05	+1.6
d and e 18.9 : 30.8 :: 12.0 : 18.9	+11.9	-6.4	+1.75	+0.35
Observer E.				
a and b 70.0 : 76.2 :: 70.63 : 70.0	+6.25	+0.63	-0.75	-0.90
a and c 70.0 : 44.1 :: 103.20 : 70.0	-25.90	+33.20	-0.12	-1.25
a and d 70.0 : 33.7	-36.25	.....	-1.00	.....
a and e 70.0 : 32.4 :: 116.50 : 70.0	-32.40	+46.50	-2.37	-0.50

TABLE XXI
COMPUTED AND FOUND RATIOS BY GROUPS

Region and observer	A Group				B Group					
	a/b	a/c	a/d	a/e	b/c		b/d		b/e	
	F	F	F	F	C	F	C	F	C	F
1, B.....	1.013	0.961	0.773	0.817	0.947	0.952	0.772	0.753	0.806	0.798
1, Be.....	0.949	0.870	0.810	0.740	0.921	0.930	0.850	0.800	0.918	0.860
2, Bo.....	0.887	1.358	1.469	1.795	1.531	1.374	1.653	1.912	2.022	1.421
2, Ca.....	0.907	1.374	1.625	1.519	1.516	1.765	1.794	2.189	1.624	1.725
2, D.....	1.081	1.840	1.484	2.579	1.710	1.383	1.372	1.594	2.382	2.172
2, B.....	0.853	1.769	1.623	2.125	2.073	1.476	1.925	1.415	2.496	2.097
2, M.....	0.875	1.277	1.421	1.552	1.460	1.176	1.626	1.377	1.779	1.532
3, A.....	1.251	1.529	1.692	.....	1.220	0.822	1.351	0.955	.....	.....
5, A.....	0.934	1.362	2.910	2.033	1.461	1.094	3.120	3.372	2.179	1.881
4, C.....	0.951	0.838	0.745	0.735	0.884	1.152	0.783	0.632	0.773	0.834
3, E.....	1.213	2.280	1.451	.....	.....	.....	.....	.....	.....	.....
5, E.....	0.930	1.580	2.071	1.862	.....	.....	.....	.....	.....	.....

- Region 1.—Lips to ear.
 2.—Upper arm, forearm to fingers.
 3.—Volar side of upper arm, axilla, side to waist.
 4.—Breast and back (sternum to spine).
 5.—Dorsal side of leg over heel and sole of foot.

TABLE XXI—Continued
COMPUTED AND FOUND RATIOS BY GROUPS—Continued

Region and observer	C Group						D Group			
	c/d			c/e			d/e			
	C	C'	F	C	C'	F	C	C'	C''	F
1, B.....	0.793	0.815	0.851	0.851	0.838	0.887	1.046	1.056	1.041	1.007
1, Be.....	0.779	0.740	0.762	0.850	0.800	0.791	0.921	0.930	1.040	1.020
2, Bo.....	1.388	1.079	1.008	1.321	1.032	1.088	1.228	0.744	1.089	1.378
2, Ca.....	1.183	1.240	0.862	1.071	0.977	1.235	0.902	0.785	1.436	1.482
2, D.....	0.803	1.152	1.154	1.394	1.571	1.791	1.737	1.362	1.552	1.123
2, B.....	0.919	0.959	1.312	1.208	1.421	1.965	1.319	1.483	1.492	1.032
2, M.....	1.113	1.170	1.150	1.218	1.320	1.692	1.093	1.119	1.471	1.442
3, A.....	1.106	1.162	1.162	.....	.....	.....	.....	.....	.....	.....
5, A.....	2.132	3.040	1.595	1.488	1.721	1.081	0.699	0.566	0.679	0.615
4, C.....	0.886	0.548	1.049	0.874	0.723	0.942	0.987	1.316	0.898	0.832

- Region 1.—Lips to ear.
 2.—Upper arm, forearm to fingers.
 3.—Volar side of upper arm, axilla, side to waist.
 4.—Breast and back (sternum to spine).
 5.—Dorsal side of leg over heel and sole of foot.

The tables show the summaries of more than 4,000 single determinations. As data, they are to be judged by the principal errors, the time-errors, and the consistency of computed to found ratios. The differences between the absolute magnitudes of the ratios of individual observers are not, for us, especially significant; we shall be interested rather in the course of the relative magnitudes. Theoretically, the principal errors of the first and second space-orders should approximate to each other with change of sign. As a rule, they are in fact of the same order; the exceptions are not numerous, and save in one instance do not seriously mar the significance of the results.

This one case is found in Table XVII. Here D in group A gives a *minus* value for the first principal error, whereas all other observers in this region give a *plus*. The three remaining values of the group are very large, whereas the corresponding values of the second space-order are very small; and we therefore suspect that the experimenter herself was at fault, that she set the standard distance on the instrument at 35 mm. (the standard for M below), and recorded it as 40. If this change were made the *minus* would become a *plus*,¹³ and the two principal errors would balance each other properly. In our later treatment of these results we have, nevertheless, left the values as they stand. As regards the opposition of signs in the principal errors, there are only six instances where the two are of the same sign. In two of these (Tables XVI, Obs. B), the values at fault are within 0.4 mm. of equality and are therefore negligible; two of the others (Table XX) were given by different observers for the same pair of points, and are probably due to the difficulties of perception.

An examination of the time-errors shows that, in general, the variables of the first are less than those of the second time-order: when the standard comes first, the variable is judged as *smaller* than when the variable comes first.

If the judgment of the variable were *easier* when the standard comes first, we should expect the m.v. of the various series to be smaller in the first time-order. We have compared the two sets of m.v. for the five observers in the region of the fore-arm, and we find that the percentages of cases in which the m.v. of the first time-order is less are 70, 60, 30, 65, 65. Since we should expect them to be smaller in 50% of the cases, some other factor is apparently at work.

Turning now to the ratios themselves, we find that they speak even more positively for the reliability of our observers. When it is recalled that the computed ratios are based upon found values, and that in the C and D groups there are two and three computed values, the approximation of these to the found values in these groups must be regarded as in general of a high order. There are, of course, exceptions. The

¹³ See D's description of the illusion, Table VII, in which he reports a *convergence* at the elbow.

localization and the judgment of extent are much more difficult in some regions than in others. And some of our observers had had little experience in psychological observation before they came to our experiment. Occasional defects are, therefore, to be expected.

(a) *The Equivalence Ratios as Measures of Sensitivity and of the Illusion.* If we may assume that all other factors are equal, then when an equivalent value is equal to the standard, the result should mean equal sensitivity; if greater, it should mean less, and if less, greater sensitivity. Turning to Table XVI, we find the following values for the five points of the A group (1st space-order), for the two observers

	B	Be
A. Center of lips.....	30	30
B. Half-way to corner.....	29.6	31.7
C. Corner of lips.....	31.2	34.3
D. Half-way to ear.....	38.8	37.0
E. 1 cm. from ear.....	36.7	40.6

It is clear that from the center of the lips to the ear there is, for Be, a gradual increase in magnitude of the equivalent values. For B, on the other hand, the curve is not quite so pronounced. The value for point-B is probably equal to the standard (the difference, -4 mm., is much below the m.v.); and the value for point-E shows a decrease in magnitude over point-D but an increase over the values for A, B, and C. When, however, a direct comparison of D and E is made (in D group), it will be seen that the ratio of the two is within 0.25 mm. of equality. If now we turn to Weber's and Vierordt's description of the relative sensitivity of points in this region, as measured by the two-point limen (Table X, p. 94), we find it to be progressively less. We thus have a first correlation. If, again, we turn to the description of the illusion (Tables I and VI), we find two slightly different accounts: for G, Be and J, a convergence of the paths from center to corner of lips and from that point a convergence to the ear; for Bo paths parallel from corner of lips to ear. Since, as we have already seen (p. 97), a convergence of paths corresponds with a decrease in sensitivity, the equivalent values for Be are, in a sense, measures of the illusion as reported by Weber, G, Be, and J; while B's values are, perhaps, measures of the illusion as reported by Bo.

We obtain a similar result if we take the equivalent values for the fore-arm. Instead, however, of comparing separately the results of the five observers, we will average the values for all observers at every point of the A group and correlate these averages with differences in sensitivity and with the illusion.

A. $\frac{1}{3}$ of distance above elbow.....	40
B. Elbow	43.6 ± 2.8
C. Wrist	27.0 ± 3.9
D. Palm	24.7 ± 3.8
E. Finger tips	19.5 ± 3.8

The general curve of sensitivity is unmistakable; there is first a decrease to the elbow, then an increase to the finger tips. The only question concerns the significance of the difference between wrist and

palm in view of the size of the m.v. Let us, however, turn to the description of the illusion. We find its course described first as parallel, then converging at elbow, then diverging at wrist, then slightly converging at palm and finally diverging or parallel to finger-tips. The single discrepancy between the two sets of results is at the palm; here, according to the averages, we should have a slight divergence or parallelism instead of convergence. The obvious conclusion, supported by the size of the m.v., points to individual differences which are masked by the averages. D, in fact, shows greater sensitivity at the elbow and thus a divergence; and both D and M show a decrease in sensitivity at the palm and so a convergence. All other observers show less sensitivity at the elbow and greater at the palm.

It would, perhaps, be fairer both to the equivalent values and to the illusion if (1) instead of taking the equivalences to the standard of the A group we take those to every standard of the various groups, and if (2) instead of selecting differences between standard and equivalent we take their quotients as measures of sensitivity. If, *e.g.*, the ratio a/b equals 1, the sensitivity for the two points is equal; if again, a/b is less than 1, then the sensitivity of a is less, and if greater then the sensitivity of a is greater than that of b. Turning then to the table of quotients, we take the 'found' values for a/b of A group, b/c of B group, c/d of C group, and d/e of D. group, for every one of the five observers, and average them; we obtain the following results:

elbow	a/b	$0.92 \pm .063$	= less sensitivity = convergence
wrist	b/c	$1.435 \pm .148$	= greater sensitivity = divergence
palm	c/d	$1.097 \pm .130$	= slightly greater = divergence or parallel
finger-tips	d/e	$1.291 \pm .171$	= greater sensitivity = divergence

Aside from the critical point at the palm, the correlation both for sensitivity and for the illusion still holds. As regards the palm, the size of the m.v. again points to equal sensitivity with the wrist. In this connection it may be recalled that, when we compared the course of the illusion with measures of sensitivity as given by Weber and Vierordt (p. 97), we found that, where the sensitivity of two points is approximately the same, there the course of the illusion may be described as converging, parallel, or diverging. The change in direction is always slight, however, and may well be due to secondary factors. There is one other slight discrepancy in the above averages, namely, the size of the ratio for the finger-tips. Since the illusion is frequently parallel at this point, the value is larger than we should expect. The reason is that, when the standard (or variable) distance was too large to go on the two middle fingers, it was placed on the first and third fingers.

The values for two of the three remaining regions give similar results. In that of upper arm, axilla, ribs, and waist, the two observers agree in giving values that show correlation both in sensitivity and in change of direction of the paths for all points except the waist. At this latter point, E shows a decided decrease in sensitivity and convergence, whereas A shows a slight increase and divergence.¹⁴ In the leg-foot region the two observers give results that correspond with the illusion throughout. Below the knee the divergence represented by the equivalent values is much greater than it was reported

¹⁴ See Table V, where it is shown that the author found a convergence and Weber a divergence at this region.

to be in the illusion, since the paths were occasionally reported as parallel; otherwise there is complete correspondence. The values for the breast-back region are less satisfactory. C reports a decrease in sensitivity for the points sternum-nipple, whereas in the illusion she reports divergence of the paths. For the next point (side of breast) in the A group she gives a decrease in sensitivity, as we should expect, but in the B group she reverses this result. F, on the other hand, conforms to the illusion as described; i. e., an increase in sensitivity from sternum to nipple, a decrease to side of breast, an increase to shoulder, and a decrease from shoulder to spine. Unfortunately, the experiment with F was not completed in detail, so that we are unable to work out the quotients of the various groups. The results of C are readily explained from her reports. She not only found it much more difficult to localise the two points than in the qualitative experiments, but she also frequently reported the presence of three or more pressure sensations instead of two, and in the latter case she chose the two that were 'most distinct' upon which to base her judgment.

In what sense, we may now ask, are the equivalent values measures of the illusion? In answering this question two facts should be kept in mind. First, we have individual differences; all investigators have agreed that there are large individual differences in sensitivity as measured by the two-point limen, and our observers have shown individual differences in the magnitude of the equivalent values. We have also found individual variations in descriptions of the illusion. Secondly, we have no way of directly comparing the relative magnitude of the equivalent value at a point and that of the separation of the two paths at that point. We have only occasional observations volunteered by the observers, and our study of the objective data, upon which to base a conclusion. We may say, then, that since at times our observers have reported the relative magnitude of the extent under the one attitude as sometimes larger and sometimes smaller than that under the other attitude, and since we have found a high correlation between equivalent values and the course of the illusion, the former is the measure of the latter very much as a smoothed curve is the measure of a curve plotted by points. In support of this analogy, it may be said that we never find the course of the paths making abrupt changes in direction; even where the convergence or divergence is described as 'quick,' it is always 'smooth.' The analogy must not, however, be taken too literally; the equivalents actually measure the illusion inversely; the plotted curve should, therefore, be reversed; and even then the smoothed curve would represent only one of the two paths.

IV. CONCLUSION: THE PSYCHOLOGY OF THE ILLUSION

Psychologically, the illusion is a perception of two cutaneous extents whose relative locality and direction change in the perception's course. This change in direction, or in distance between the two extents, is the characteristic feature of the perception. The conditions of the experience are not simple; but the results of our study seem to show that the essential factors are two in number: (1) differences in sensitivity of the cutaneous surface, and (2) continuous movement of a two-point stimulus. The influence of the former

is evidenced by the high correlation between course of the paths and degree of sensitivity as measured by the two-point limen, and also by our own correlation between equivalence ratios and sensitivity on the one hand and course of the paths on the other. The importance of the second factor is shown by the fact that with discontinuous movement the illusion is absent. In accepting these two as primary, we necessarily disallow other factors which have been thought to condition the illusion. Since the congenitally blind individual may have the perception, we cannot regard visualization as an essential, although in the normal individual it is a frequent component of the experience. We cannot either accept the view that relative ease of localization and degree of distinctness are necessary conditions of the illusion. In the first place the high correlation between these factors and degrees of sensitivity, and change in course of the paths, implies a single physiological basis; and we may assume that in general the common factor is sensitivity, without assuming that ease of localization and distinctness of impression have no other condition (such as, for example, intensity of stimulus, attention). In the second place we have one instance, at least, where the factor of the moving stimulus cuts across the secondary factors of ease of localization and distinctness, so that the typical illusion occurs in direct opposition to distinctness of impression;¹⁵ and the equivalence ratio obtained with an unmoved stimulus in its turn shows directly the influence of distinctness. Indeed, it seems reasonable to suppose that both distinctness of experience and visualization, when they are independent of sensitivity, are much more frequently operative with an unmoved than with a moved stimulus. We do not believe, therefore, that Judd is justified in arguing from certain equivalence ratios, obtained by Camerer, to the Weber Illusion. Our results seem to show that, on the contrary, these factors function as secondary conditions. In our qualitative experiments the only certain evidence we found for factors other than sensitivity and movement of stimulus was: (1) where the sensitivity of two points is 'approximately the same,' there we may find the paths parallel, or diverging, or converging; (2) where the rate of movement is too slow to give rise to the typical illusion, there we find new intermediate convergences and divergences which are irregular and instable; and (3) the illusion is much more stable and uniform in the normal than in the blind individual. The first two

¹⁵ See the reports of C, pp. 103, 117.

of these results may well have resulted from such conditions as ease of localization, distinctness of impression, visual imagery, etc., when the one or the other of the essential conditions is in abeyance. The third seems to mean that visual imagery serves to stabilize the illusion.¹⁶

V. SUMMARY

1. Weber's illusion has been found on 24 of 42 regions of the body; it occurs more frequently in the longitudinal than in the transverse direction; and, aside from slight individual differences, it is the same in form for all normal observers.

2. The illusion is apparently conditioned upon differences of cutaneous sensitivity, and upon continuous movement of the two-point stimulus. The optimal rate of movement lies between 4 and 12 cm. per sec. Visualization, and distinctness of impression, may occur as secondary conditions; but since the illusion is found with congenitally blind observers, and also in direct opposition to distinctness of impression, neither is an essential factor.

3. Equivalence ratios, determined by the Method of Equivalents for places that correspond with points of change in the illusion, furnish a measure of the illusion in the sense that an increase in an equivalent value corresponds with a convergence, a decrease with a divergence, and an equality with a parallel course of the paths.

¹⁶ We have stated the details and cited the references above, p. 99. M. F. Washburn, Ueber den Einfluss der Gesichtsassociationen auf die Raumwahrnehmung der Haut, *Phil. Stud.*, xi, 1895, 190 ff., had shown that Camerer's equivocal results were due to visualization; a finding which has since been confirmed by Gemelli, *op. cit.*, 133-177, 282. Judd, however, seems to have rejected Washburn's explanation on the ground that not all observers have visual imagery; he accordingly substituted 'Deutlichkeit.'

A CHECKING TABLE FOR THE METHOD OF CONSTANT STIMULI¹

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In the computation of a limen, according to the *phi-gamma* hypothesis, from data obtained by the method of constant stimuli (or the method of constant stimulus differences), one finds for every stimulus (or stimulus difference) employed the five values: $P, \gamma P, xP, xxP$, and $x \gamma P$.² It is then necessary to obtain the sum of each one of these five values for all of the stimuli used, namely: $[P], [\gamma P], [xP], [xxP]$ and $[x\gamma P]$. It is frequently desirable to check the required additions, which, since both positive and negative quantities occur, are especially liable to error. The simplest procedure for checking,³ known as 'cross-addition,' consists in finding for every stimulus the total of the five values (a total which we shall designate by the symbol 'T'). If no mistakes have occurred in the additions, the sum of the T-values thus obtained will equal the total of the five sums $[P], [\gamma P], [xP], [xxP]$, and $[x\gamma P]$.

But the five values mentioned, which are obtained for every stimulus, depend solely on the x and the p (percentage of judgments) for that particular stimulus. If Urban's tables⁴ are used we are limited to 15 possible x 's (-7 to 7) and 99 possible p 's ($.01$ to $.99$). There are, then, only 1,485 possible combinations⁵ of p and x , and only that number of possible values of the quantity T under these conditions.

The accompanying checking table⁶ contains the values of T just mentioned for every x and every p . Every value of T in the table is the sum of the five values $P, \gamma P, xP, xxP$, and $x \gamma P$ for the corresponding x and p , as given in Urban's tables. Every line of the table contains

¹ From the Department of Psychology, Cornell University.

² For the general procedure in these computations see: E. B. Titchener, *Experimental Psychology, Quantitative Student's Manual*, 92 ff., and E. G. Boring, Urban's Tables and the Method of Constant Stimuli, *Amer. Jour. Psych.*, 28, 1917, 280 ff.

³ The method used by Fernberger and by Urban, and described by Boring, *op. cit.*, 288, involves more labor than does mere 'cross addition,' but localizes more closely any possible errors. Its use here, however, would require two tables instead of our one.

⁴ F. M. Urban, *Hilfstabellen für die Konstanzmethode*, *Arch. f. d. ges. Psych.* 24, 1912, 236 ff. and 25, *Literaturber.*, 84; *Die Praxis der Konstanzmethode*, Leipzig, 1912.

Directions for using these tables will be found in Boring, *op. cit.*

⁵ Since $15 \times 99 = 1,485$.

⁶ I am indebted to my former associates in the Cornell Laboratory, Miss J. M. Gleason, Dr. E. G. Boring, Dr. W. S. Foster, Mr. L. B. Hoisington, and Mr. H. G. Bishop for much valuable assistance in the preparation of this table; and to Miss K. M. Schutt of Ithaca for her careful work in typing the copy reproduced here.

p	X=1	X=2	X=3	X=4	X=5	X=6	X=7
.51	3.0348	7.0516	13.0679	21.0839	31.0994	43.1145	57.1291
.52	3.0683	7.1000	13.1299	21.1581	31.1843	43.2088	57.2314
.53	3.1002	7.1450	13.1858	21.2225	31.2552	43.2835	57.3079
.54	3.1306	7.1869	13.2358	21.2777	31.3122	43.3402	57.3644
.55	3.1595	7.2250	13.2791	21.3218	31.3531	43.3730	57.3815
.56	3.1870	7.2599	13.3164	21.3565	31.3801	43.3873	57.3781
.57	3.2130	7.2914	13.3473	21.3809	31.3920	43.3807	57.3469
.58	3.2371	7.3190	13.3716	21.3947	31.3885	43.3529	57.2880
.59	3.2600	7.3432	13.3893	21.3981	31.3696	43.3039	57.2007
.60	3.2804	7.3630	13.3992	21.3890	31.3325	43.2298	57.0808
.61	3.3000	7.3800	13.4042	21.3723	31.2845	43.1406	56.9409
.62	3.3174	7.3925	13.4006	21.3421	31.2167	43.0245	56.7654
.63	3.3329	7.4012	13.3910	21.3020	31.1346	42.8886	56.5641
.64	3.3464	7.4051	13.3722	21.2477	31.0315	42.7238	56.3245
.65	3.3581	7.4052	13.3469	21.1831	30.9138	42.5392	56.0588
.66	3.3676	7.4011	13.3143	21.1071	30.7796	42.3320	55.7639
.67	3.3749	7.3915	13.2716	21.0150	30.6219	42.0921	55.4258
.68	3.3802	7.3784	13.2231	20.9141	30.4516	41.8356	55.0660
.69	3.3830	7.3595	13.1642	20.7967	30.2574	41.5460	54.6628
.70	3.3835	7.3357	13.0966	20.6660	30.0439	41.2304	54.2252
.71	3.3813	7.3066	13.0195	20.5204	29.8090	40.8854	53.7494
.72	3.3768	7.2723	12.9340	20.3616	29.5550	40.5145	53.2397
.73	3.3689	7.2307	12.8370	20.1849	29.2755	40.1086	52.6843
.74	3.3586	7.1853	12.7301	19.9928	28.9736	39.6724	52.0891
.75	3.3450	7.1328	12.6124	19.7842	28.6481	39.2040	51.4521
.76	3.3283	7.0732	12.4829	19.5570	28.2959	38.6994	50.7675
.77	3.3083	7.0068	12.3413	19.3114	27.9173	38.1589	50.0361
.78	3.2839	6.9324	12.1858	19.0442	27.5078	37.5764	49.2503
.79	3.2563	6.8506	12.0178	18.7581	27.0713	36.9573	48.4163
.80	3.2243	6.7603	11.8352	18.4491	26.6020	36.2940	47.5249
.81	3.1875	6.6603	11.6360	18.1148	26.0965	35.5816	46.5695
.82	3.1467	6.5515	11.4218	17.7574	25.5585	34.8246	45.5563
.83	3.1007	6.4330	11.1912	17.3752	24.9850	34.0200	44.4814
.84	3.0495	6.3044	10.9434	16.9667	24.3741	33.1657	43.3415
.85	2.9907	6.1603	10.6694	16.5178	23.7056	32.2328	42.0995
.86	2.9263	6.0055	10.3772	16.0415	22.9985	31.2483	40.7906
.87	2.8545	5.8355	10.0596	15.5266	22.2366	30.1896	39.3857
.88	2.7751	5.6511	9.7177	14.9749	21.4227	29.0614	37.8906
.89	2.6859	5.4471	9.3428	14.3731	20.5379	27.8373	36.2716
.90	2.5870	5.2243	8.9367	13.7242	19.5869	26.5246	34.5374
.91	2.4769	4.9801	8.4951	13.0219	18.5605	25.1109	32.6731
.92	2.3528	4.7085	8.0078	12.2507	17.4370	23.5670	30.6405
.93	2.2133	4.4076	7.4720	11.4067	16.2115	21.8865	28.4316
.94	2.0554	4.0713	6.8782	10.4757	14.8639	20.0429	26.0124
.95	1.8743	3.6911	6.2118	9.4362	13.3645	17.9966	23.3324
.96	1.6626	3.2532	5.4509	8.2559	11.6682	15.6877	20.3147
.97	1.3971	2.7122	4.5211	6.8236	9.6196	12.9092	16.6923
.98	1.1107	2.1363	3.5383	5.3163	7.4707	10.0012	12.9081
.99	.7089	1.3451	2.2065	3.2934	4.5056	6.0433	7.8063

.27	
.28	
.29	
.30	
.31	
.32	
.33	
.34	
.35	
.36	
.37	
.38	
.39	
.40	4
.41	4
.42	4
.43	4
.44	4
.45	4
.46	43
.47	43
.48	43
.49	43
.50	43

p	X = -7	X = -6	X = -5	X = -4	X = -3	X = -2	X = -1	X = 0
.01	5.8579	4.3203	3.0080	2.0210	1.1595	.5235	.1127	-.0727
.02	9.7281	7.1974	5.0431	3.2649	1.8631	.8375	.1881	-.0851
.03	12.5809	9.2914	6.4954	4.1930	2.3841	1.0686	.2469	-.0813
.04	15.3119	11.2923	7.8800	5.0749	2.8773	1.2868	.3036	-.0723
.05	17.5872	12.9552	9.0269	5.8024	3.2818	1.4649	.3519	-.0574
.06	19.6082	14.4293	10.0411	6.4437	3.6368	1.6207	.3954	-.0392
.07	21.4324	15.7575	10.9527	7.0181	3.9536	1.7592	.4351	-.0189
.08	23.0983	16.9684	11.7820	7.5391	4.2398	1.8841	.4718	.0031
.09	24.6313	18.0809	12.5423	8.0155	4.5005	1.9973	.5059	.0263
.10	26.0376	19.0998	13.2371	8.4496	4.7373	2.0999	.5376	.0505
.11	27.3456	20.0459	13.8811	8.8507	4.9550	2.1939	.5673	.0753
.12	28.5668	20.9282	14.4803	9.2231	5.1565	2.2805	.5953	.1007
.13	29.6947	21.7416	15.0316	9.5646	5.3406	2.3595	.6215	.1265
.14	30.7546	22.5049	15.5479	9.8835	5.5118	2.4327	.6463	.1526
.15	31.7421	23.2148	16.0270	10.1786	5.6696	2.4999	.6697	.1789
.16	32.6789	23.8875	16.4801	10.4569	5.8178	2.5628	.6921	.2055
.17	33.5392	24.5036	16.8942	10.7102	5.9520	2.6196	.7129	.2319
.18	34.3503	25.0840	17.2831	10.9474	6.0772	2.6723	.7327	.2584
.19	35.1151	25.6302	17.6483	11.1696	6.1938	2.7211	.7515	.2850
.20	35.8361	26.1442	17.9912	11.3773	6.3024	2.7665	.7695	.3116
.21	36.5089	26.6229	18.3097	11.5695	6.4022	2.8080	.7865	.3381
.22	37.1383	27.0696	18.6060	11.7474	6.4942	2.8458	.8025	.3643
.23	37.7315	27.4899	18.8841	11.9140	6.5795	2.8808	.8179	.3906
.24	38.2837	27.8802	19.1413	12.0670	6.6575	2.9126	.8323	.4166
.25	38.8005	28.2446	19.3807	12.2088	6.7292	2.9416	.8460	.4425
.26	39.2815	28.5828	19.6020	12.3392	6.7945	2.9677	.8590	.4682
.27	39.7311	28.8980	19.8075	12.4595	6.8542	2.9905	.8713	.4938
.28	40.1505	29.1911	19.9976	12.5702	6.9084	3.0127	.8830	.5191
.29	40.5354	29.4592	20.1706	12.6698	6.9567	3.0314	.8939	.5441
.30	40.8950	29.7086	20.3307	12.7614	7.0004	3.0481	.9043	.5690
.31	41.2256	29.9368	20.4762	12.8435	7.0390	3.0625	.9140	.5935
.32	41.5304	30.1464	20.6088	12.9177	7.0731	3.0750	.9232	.6179
.33	41.8022	30.3319	20.7251	12.9816	7.1016	3.0849	.9317	.6418
.34	42.0577	30.5056	20.8330	13.0401	7.1269	3.0935	.9398	.6657
.35	42.2810	30.6558	20.9250	13.0889	7.1471	3.1000	.9473	.6892
.36	42.4819	30.7896	21.0057	13.1303	7.1632	3.1045	.9542	.7123
.37	42.6633	30.9092	21.0766	13.1654	7.1758	3.1076	.9607	.7353
.38	42.8156	31.0079	21.1333	13.1919	7.1836	3.1085	.9666	.7578
.39	42.9487	31.0924	21.1803	13.2121	7.1880	3.1080	.9720	.7800
.40	43.0546	31.1576	21.2141	13.2242	7.1880	3.1066	.9768	.8018
.41	43.1459	31.2117	21.2402	13.2315	7.1853	3.1020	.9814	.8235
.42	43.2124	31.2479	21.2541	13.2309	7.1784	3.0966	.9853	.8447
.43	43.2573	31.2687	21.2576	13.2241	7.1681	3.0896	.9888	.8655
.44	43.2815	31.2743	21.2507	13.2107	7.1542	3.0811	.9918	.8865
.45	43.2847	31.2648	21.2335	13.1908	7.1367	3.0712	.9943	.9060
.46	43.2736	31.2422	21.2070	13.1653	7.1162	3.0599	.9964	.9257
.47	43.2305	31.2019	21.1694	13.1327	7.0920	3.0470	.9980	.9449
.48	43.1732	31.1488	21.1225	13.0945	7.0645	3.0326	.9991	.9636
.49	43.0967	31.0817	21.0662	13.0503	7.0339	3.0170	.9998	.9821
.50	43.0000	31.0000	21.0000	13.0000	7.0000	3.0000	1.0000	1.0000

p	X = -7	X = -6	X = -5	X = -4	X = -3	X = -2	X = -1	X = 0
.51	42.8843	30.9047	20.9246	12.9441	6.9631	2.9816	.9998	1.0175
.52	42.7476	30.7942	20.8389	12.8817	6.9227	2.9618	.9991	1.0346
.53	42.5935	30.6711	20.7446	12.8141	6.8796	2.9408	.9980	1.0511
.54	42.4230	30.5334	20.6410	12.7407	6.8332	2.9183	.9964	1.0671
.55	42.2251	30.3818	20.5271	12.6610	6.7835	2.8946	.9943	1.0826
.56	42.0115	30.2161	20.4041	12.5757	6.7308	2.8695	.9918	1.0976
.57	41.7777	30.0357	20.2712	12.4843	6.6749	2.8430	.9888	1.1121
.58	41.5252	29.8419	20.1293	12.3873	6.6160	2.8154	.9853	1.1259
.59	41.2511	29.6327	19.9770	12.2841	6.5537	2.7862	.9814	1.1393
.60	40.9540	29.4070	19.8135	12.1738	6.4876	2.7554	.9768	1.1518
.61	40.6451	29.1728	19.6445	12.0603	6.4202	2.7242	.9720	1.1640
.62	40.3102	28.9201	19.4631	11.9393	6.3486	2.6909	.9666	1.1754
.63	39.9587	28.6554	19.2736	11.8132	6.2742	2.6568	.9607	1.1861
.64	39.5793	28.3708	19.0707	11.6789	6.1956	2.6207	.9542	1.1961
.65	39.1834	28.0744	18.8600	11.5401	6.1145	2.5836	.9473	1.2054
.66	38.7691	27.7650	18.6406	11.3959	6.0307	2.5455	.9398	1.2139
.67	38.3240	27.4335	18.4063	11.2426	5.9422	2.5053	.9317	1.2216
.68	37.8666	27.0932	18.1664	11.0859	5.8519	2.4644	.9232	1.2285
.69	37.3802	26.7324	17.9126	10.9209	5.7572	2.4217	.9140	1.2345
.70	36.8714	26.3556	17.6483	10.7496	5.6592	2.3775	.9043	1.2396
.71	36.3382	25.9614	17.3724	10.5712	5.5577	2.3318	.8939	1.2437
.72	35.7841	25.5525	17.0868	10.3870	5.4530	2.2851	.8830	1.2469
.73	35.2007	25.1226	16.7871	10.1943	5.3440	2.2373	.8713	1.2488
.74	34.5925	24.6752	16.4760	9.9948	5.2315	2.1863	.8590	1.2498
.75	33.9589	24.2098	16.1529	9.7880	5.1154	2.1346	.8460	1.2495
.76	33.2959	23.7236	15.8161	9.5732	4.9949	2.0814	.8323	1.2480
.77	32.6045	23.2175	15.4661	9.3506	4.8705	2.0264	.8179	1.2452
.78	31.8801	22.6878	15.1006	9.1184	4.7414	1.9694	.8025	1.2407
.79	31.1275	22.1383	14.7221	8.8787	4.6084	1.9110	.7865	1.2349
.80	30.3409	21.5648	14.3278	8.6297	4.4706	1.8505	.7695	1.2274
.81	29.5165	20.9646	13.9159	8.3702	4.3276	1.7879	.7515	1.2180
.82	28.6593	20.3416	13.4891	8.1020	4.1802	1.7239	.7327	1.2070
.83	27.7676	19.6940	13.0464	7.8244	4.0282	1.6578	.7129	1.1939
.84	26.8397	19.0215	12.5873	7.5373	3.8714	1.5896	.6921	1.1787
.85	25.8521	18.3066	12.1004	7.2336	3.7062	1.5183	.6697	1.1605
.86	24.8298	17.5675	11.5979	6.9211	3.5368	1.4451	.6463	1.1400
.87	23.7543	16.7914	11.0714	6.5944	3.3604	1.3695	.6215	1.1165
.88	22.6316	15.9822	10.5235	6.2555	3.1781	1.2913	.5953	1.0899
.89	21.4414	15.1257	9.9451	5.8987	2.9870	1.2099	.5673	1.0593
.90	20.1920	14.2284	9.3401	5.5268	2.7887	1.1255	.5376	1.0247
.91	18.8761	13.2849	8.7055	5.1379	2.5821	1.0381	.5059	.9855
.92	17.4739	12.2814	8.0324	4.7269	2.3650	.9467	.4718	.9405
.93	15.9844	11.2175	7.3207	4.2941	2.1376	.8512	.4351	.8891
.94	14.3928	10.0831	6.5641	3.8359	1.8982	.7515	.3954	.8300
.95	12.6762	8.8626	5.7529	3.3470	1.6448	.6465	.3519	.7612
.96	10.8011	7.5333	4.8728	2.8195	1.3737	.5350	.3036	.6795
.97	8.6423	6.0092	3.8696	2.2236	1.0711	.4122	.2469	.5751
.98	6.4503	4.4660	2.8579	1.6261	.7705	.2913	.1881	.4613
.99	3.6335	2.4665	1.5250	.9088	.4181	.1527	.1127	.2981

1
12
271
5 11
511

the T's for every x used by Urban and a single p, while every column contains the T's for every p and a single x.⁷

The use of the checking table is simple. After obtaining from Urban's tables the five values required for a given stimulus (or stimulus difference), the T for that stimulus, as determined by its x and p, is read from our table and placed in a sixth column. (Note that T is not the same for p and 1.00-p.) The same procedure is followed for every stimulus involved in the calculation. The sum of this sixth column is found just as the sums of the five other columns. If there are no mistakes in computation, the sum of the T-column will be equal to the sum of the sums of the other five columns. For, since each T is obtained according to the formula,

$$T = P + \gamma P + xP + xxP + x\gamma P,$$

it follows that

$$[T] = [P] + [\gamma P] + [xP] + [xxP] + [x\gamma P].$$

If, however, the sum of the T-column is not equal to the sum of the other five columns, a mistake has been made. There are two possible sources of error. One possibility is that one or more of the additions is wrong; the other is that an error has been made in copying from either Urban's tables or the checking table. In practice, the writer has found most of his discrepancies to be due to the latter cause.

In building the checking table, we used Urban's tables as published in *Die Praxis der Konstanzmethode*, 1912, which contains two corrections of the tables as originally published in the *Archiv* (for 6^2P when $p = .89$ and $.90$). In the course of our work, another error in Urban's tables (both editions) came to light. The value 5^2P when $p = .90$ is given as 14.4388 and should be 13.4388. We used the corrected value, and our table will show this discrepancy from either edition of Urban.

⁷ The values of T were themselves checked by finding the sum of each column in our table. It can readily be shown that the sums of two columns of T, having x's numerically equal but different in sign, differ by 2 [xP]. The columns in our table were required to show this difference as a criterion of correctness.

NOTE
DR. MORGAN ON THE MEASUREMENT OF ATTENTION

By K. M. DALLENBACH

In the introduction to his work on "The Overcoming of Distraction and Other Resistances" (*Archives of Psychology*, no. 35, 1916) Dr. J. J. B. Morgan offers some criticisms of my paper on the measurement of attention (this JOURNAL, 24, 1913, 465 ff.), which call for a reply.

(1) The principal criticism is as follows (p. 8). "Because this correlation [between clearness-scale and speed and accuracy of work] was rather high the conclusion was drawn that the true measure of attention is a subjective scale of clearness. Such a conclusion presupposes that the amount and precision of the work was influenced only by changes in attention. This could not be known unless all practice, fatigue and feeling factors were eliminated. But supposing that the experimenters had eliminated all these (which they certainly did not), why not take the amount and precision of the work as a measure of attention directly and not by a roundabout procedure, involving endless difficulties, adopt a measure which is from the very nature of it much less precise?"

A reader of these sentences would hardly guess that the 'presupposition' referred to is practically a quotation from my own paper. The conclusion which I draw from my experimental results holds, I say, provided that certain things are true; and one of these things is "that the work itself is not influenced by anything other than a change in the attention" (p. 499). This, my critic affirms, cannot be known unless practice, fatigue and feeling are eliminated. The suggestion again comes from my paper. I sought to stabilise practice by a three months' drill (p. 472). I sought to prevent fatigue by frequent rests and a division of the experiment (p. 474); the duration of the single observation was 30 to 60 seconds (pp. 474, 493 f.); and only five or six of these observations were made in the hour (pp. 474, 492). I sought to control feeling by requiring a report of affective mood (p. 492) from observers specially trained in introspection (p. 467). If dogmatism were at all permissible in science, it would be nearer the truth to say that the experimenters *did* eliminate these sources of error than to say, as Dr. Morgan roundly declares, that they did *not*. I should be unwilling to dogmatise on either side; but I point out that Dr. Morgan's criticism does not bear upon omissions of my work, but simply denies that I have succeeded in doing what I very carefully tried to do. What his grounds for denial are, I do not know.

Nor do I know how a method of direct, face-to-face observation can be termed 'roundabout.' To measure attention by something else, that is not attention, would be roundabout; to lay a scale of observational measurement upon the attentive state itself is, I should suppose, the most direct course that an experimenter could follow.

But I could not, in any case, measure attention by "amount and precision of the work." Dr. Morgan will hardly maintain in serious-

ness that amount and precision of work are, in general, influenced by nothing else than attention. And even if that procedure were legitimate, my problem was to measure attention in terms of clearness.

(2) Yes, rejoins Dr. Morgan, in terms of a theory! "Experimental work instead of seeking to sift down facts has been used to support one theory or another" (pp. 1 f.). I do not see how an experimental problem can even be formulated without some sort of preceding theory or hypothesis. But I can assure Dr. Morgan that my results would have been published if they had negated the hypothesis which they were meant to test. I think that I have brought out facts of observation, and I think that they confirm the hypothesis in question. If Dr. Morgan can show that they support any other and contradictory hypothesis, I shall endeavor to test that.

(3) A minor point of criticism concerns Wundt's rule for the choice of distractors within the sense-department. Dr. Morgan asserts that I distracted from the tone of a variator by "sounds varying from a metronome to a graphophone" (pp. 4, 8 f.). Would the reader gather from this account that I used eight sets of distractors, including flicker (9 rhythms and 4 intensities) and the electrical current (3 intensities)? Or that phonograph and metronome were the *only* sound-distractors that I employed? Or that I have stated the order of effectiveness of the distractors, in the light both of my objective results and of the observers' reports (pp. 472, 488)? If Dr. Morgan really thinks that the use of the phonograph brought the sound of the variator anywhere near the differential limen (which is the gist of Wundt's rule), my own and my observers' experience proves that he is mistaken.

(4) Dr. Morgan makes me conclude that "since the only way to measure clearness is introspectively, therefore introspection must be the only measure of attention" (p. 2). I nowhere draw that conclusion. The dogmatism is, again, Dr. Morgan's and not mine.

BOOK NOTES

The sense of taste. By H. L. HOLLINGWORTH and A. T. POFFENBERGER, JR. New York, Moffat, Yard and Co., 1917. 200 p.

This book attempts to give a kind of bird's-eye view of what we know of the sense of taste, in fourteen chapters, its qualities, organization, sensitiveness, relation of qualities, the organ, experiments on the taste mechanism, substances that produce it, functions of the mechanism, development in the individual, evolution of taste, gustatory imagination and memory, unusual and abnormal taste experiences, food and flavor, and finally, the esthetic value of taste. The authors have here given us a pretty well proportioned survey of these very diverse aspects of the study of this subject, but in looking over such a handbook one is very strongly impressed with the extremely superficial character which is inseparable from such a plan, with from one to three or four pages each on such subjects as the evolution of taste, the Pawlow studies, the abnormal tastes, discussions of the relation of food and flavor. As we need broader synthetic views in psychology such a book as this is worth while. It has to be very dry and general, a mere setting into juxtaposition a lot of facts which are not much correlated with each other or with life.

Our more specific and emphatic criticisms of this book are, first, that so far as the writer has noticed, there is not a single reference and for a book of this kind, which has to be little more than a list of topics, this makes the book practically worthless. The pupil has no guide and the teacher no incentive to go outside these pages, and to cram them up without following the sidelights would be about as worthless and antipedagogical work as could well be conceived. The other criticism is that in these days of applied psychology, and when the applications of a psychology of taste are so many and great, there is no allusion to these. Indeed, so careful have the authors been not to touch applied psychology, that their section on flavors and foods in this day of Pawlow is an anachronism. It is difficult to see for whom such a book was intended or whom it will help.

The origin and evolution of life, on the theory of action, reaction, and interaction of energy. By HENRY FAIRFIELD OSBORN. New York, Charles Scribner's Sons, 1917. 322 p.

This is a very able and competent presentation of the physico-chemico theory of not only the development but the origin of life. The author assumes that biologists have been too provincial in applying only principles from their own department, whereas the time has now come when they must lay new and more solid foundations in the physical sciences. He carries his study through the general field of the evolution of life, showing that vitalism has no place.

Nietzsche, the thinker; a study. By WILLIAM MACKINTIRE SALTER. New York, Henry Holt and Co., 1917. 539 p.

The author was for a long time one of the leaders in the ethical culture movement, and has made a surprisingly minute study of Nietzsche, more thorough, perhaps, than any other in any language.

The reader of this will have a pretty good idea of Nietzsche's position on most subjects; unfortunately, however, not on all. The author has not brought to the fore Nietzsche's extreme negative attitude toward Christianity. We do not quite understand why. Another criticism of the book is that the author has apparently not made the slightest concession to the modern psychoanalytic method of treatment. He has confined himself to a very pragmatic, lucid, and well-arranged picture of Nietzsche, largely from his own phraseology.

The romance of escapes; studies of some historic flights with a personal commentary. By TIGHE HOPKINS. Boston, Houghton Mifflin Co., 1917. 395 p.

This is a comprehensive survey of escapes in general, and the author shows that there are points where fiction cannot enter; that there are great moments; that great escapes are rare. Coming closer to his subject, he discusses escapes from the Inquisition, from Siberia to Paris, Rough Riders, the Boers, Louis Napoleon's passage from exile to Emperor, prisoners of war, escapes from the revenge of Robespierre, the Empress Eugénie and the dentist, the first man who broke the Bastille. These are certainly thrilling tales.

The Jesus of history. By T. R. GLOVER. New York, George H. Doran Co. (c. 1917). 225 p.

This book grew out of lectures given in many cities of India during the winter of 1915-16. They were taken down in shorthand at Calcutta and revised in Madras, and here and there other articles are incorporated. He treats of Jesus' childhood and youth, the man and His mind, teachers and pupils, Jesus' teaching about God, man, sin, choice of the cross, the church in the Roman Empire, Jesus in Christian thought.

Records of the life of Jesus. Book I: The record of Mt-Mk-Lk. Book II: The record of John. By HENRY BURTON SHARMAN. New York, George H. Doran Co. (c. 1917). 319 p.

This book is a very useful kind of gospel harmony and is apparently well up-to-date. The method of parallel columns for the synoptic gospels is the same as was adopted long ago by Robertson; while the fourth gospel is separated and treated by itself. It is a very convenient form of colligating the material of the gospels and will be welcomed by scholars.

Educational psychology. By KATE GORDON. New York, Henry Holt and Co., 1917. 294 p.

This book is designed for students of pedagogy in colleges and normal schools, and pre-supposes an elementary knowledge of psychology. It treats of the growth of human structure, behavior, instinct, motor and sensory capacities, the learning process, imagination, observation and report, memory, reason, syllogism, transfer of training and of ideas, attention, feeling, will, psychology of language-teaching, drawing, and arithmetic.

Mankind; racial values and the racial prospect. By SETH K. HUMPHREY. New York, Charles Scribner's Sons, 1917. 223 p.

This volume of papers is devoted to such topics as the principles of inheritance, its significance, birth-rate and race values, deficient

increase of the superior, excessive increase of the inferior, human values in reserve and their exhaustion, rise of the Aryan, the nations at war, Germany, America as the melting-pot, the relations of negro and white, the labor immigrant, and finally, eugenics. The book is untechnical, and is based on the fundamental conception that all is not well with the human race but that it can be bettered.

An introduction to special school work. By MARION F. BRIDIE. New York, Longmans, Green and Co., n. d. 238 p.

This is devoted to the education of mentally deficient children, and treats of understanding, preparatory class, sense-training, reading, oral lessons, the manual-oral class, number work, physical training, junior manual training, vocational training for boys and for girls, school organization.

How children learn. By FRANK N. FREEMAN. Boston, Houghton Mifflin Co. (c. 1917). 322 p.

This is a study in applied psychology. It begins with the nervous system, then discusses the relation of native and acquired responses, the native being play, imitation and self-assertion, instinctive social attitudes and types, speech, acquiring skill, building up perception, association and memorizing, problem solving or thinking, general principles regarding the child's mental development, transfer of general training, mental economy and control, mental hygiene.

Psychology; general introduction. By CHARLES HUBBARD JUDD. Boston, Ginn and Company, (c. 1917). 358 p.

This is a revised edition, which we are told has been largely rewritten. The author flatters himself that the emphasis he laid on motor processes in the edition of 1907 was more than justified by behaviorism. The present edition goes yet further in this direction, expanding the doctrine of attitudes.

Troubles mentaux de guerre. By JEAN LÉPINE. Paris, Masson et Cie, 1917. 203 p.

This is an excellent compend of the subject up to its date. The chief topics are, mental concussion, depressive, neurasthenic, emotional states, chronic nervous trouble, specific diseases; while in part second, we have four chapters of practical applications of these principles. It is a very interesting, suggestive and timely compend, with an admirable bibliography.

A social theory of religious education. By GEORGE ALBERT COE. New York, Charles Scribner's Sons, 1917. 361 p.

This work attempts to answer the question, "What consequences for religious education follow from the now widely accepted social interpretation of the Christian message?" The writer holds that this gives a new meaning to every-day affairs and changes our outlook upon life, our relations to children, politics, etc. Accordingly, he first attempts to define the social standpoint, together with the philosophical setting of the new sociological ideas in education and the place of the individual in such a scheme. He next develops the idea that a social interpretation of Christianity requires social reconstruction in the aims, essentials, process, theory of education, and gives a new function to the church as an educator. The psychological background of a socialized

religious education requires us to study man's social nature, children's faith in God, their religious limitations, struggles with sin, the learning process considered as the achievement of character. Next comes the organization of such an education in family, church school, relations between state and church, the denominational department of religious education; and lastly, he discusses present tendencies in religious education from the social standpoint. The types are Roman-Catholic, dogmatic Protestant, rationalistic Protestant, ecclesiastical type, and finally, that of liberalism.

War-shock; the psycho-neuroses in war psychology and treatment. By M. D. EDER. Philadelphia, P. Blakiston's Son and Co., 1917. 154 p.

This is a very interesting treatment because it is based on a large amount of clinical experience and because the author is a very ardent believer in the method of suggestion. Very interesting are his tables giving in a condensed way a summary of one hundred cases.

Rest, suggestion, and other therapeutic measures in nervous and mental diseases. By FRANCIS X. DERCUM. 2d ed. Philadelphia, P. Blakiston's Son and Co. (c. 1917). 395 p.

This volume was written for the System of Physiological Therapeutics and is a useful book, but many will believe that the chapter on psycho-analysis (pages 334-354) is very inadequate, and it would be very easy to make out that the author has not understood the system he criticizes.

Handicaps of childhood. By H. ADDINGTON BRUCE. New York, Dodd, Mead and Co., 1917. 310 p.

This interesting book in ten chapters treats of the mentally backward, the only child, the sulker, jealousy, selfishness, bashfulness, stammering, fairy tales that handicap, night terrors, and finally, conclusions.

The tree of life. An expose of physical regeneration on the three-fold plane of bodily, chemical and spiritual operation. By GEORGE W. CAREY. Los Angeles, George W. Carey, 1917. 60 p.

An analysis of the learning process in the snail, Physa gyrina Say. By ELIZABETH LOCKWOOD THOMPSON. Behavior Monographs, Vol. 3, no. 3. 1917. Boston, Henry Holt and Co. 97 p.

The effect of length of blind alleys on maze learning: an experiment on twenty-four white rats. By JOSEPH PETERSON. Behavior Monographs, Vol. 3, no. 4, 1917. Boston, Henry Holt and Co. 53 p.

Sull' applicazione dei metodi psico-fisici all'esame dei candidati all'aviazione militare. By AGOSTINO GEMELLI. (Reprinted from Rivista di Psicologia, Agosto, 1917.) Milan, 1917. 42 p.

The Balfour visit. Edited by CHARLES HANSON TOWNE. New York, George H. Doran Co. (c. 1917). 87 p.

The speed and accuracy of motor adjustments. By JOHN J. B. MORGAN. (Reprinted from Journal of Experimental Psychology, June, 1917, Vol. 2, no. 3.) p. 225-248.

- Apparatus for recording continuous discrimination reactions.* By H. C. McCOMAS. (Reprinted from *Journal of Experimental Psychology*, June, 1917, Vol. 2, no. 3.) p. 171-177.
- Action of some opium alkaloids on the psychological reaction time.* By DAVID I. MACHT and SHACHNE ISAACS. (Reprinted from *Psychobiology*, July, 1917, Vol. 1, no. 1.) p. 19-32.
- Lecciones de antropologia.* By JULIAN RESTREPO-HERNANDEZ. Bogota, Casa Editorial de Arboleda y Valencia, 1917. 227 p.
- How to get what you want.* By ORISON SWETT MARDEN. New York, Thomas Y. Crowell Co. (c. 1917). 331 p.
- The association test as a substitute for the quiz.* By JUNE E. DOWNEY. (Reprinted from *School and Society*, July 7, 1917, Vol. 6, no. 132.) p. 23-25.
- The Stanford adult intelligence tests.* By JUNE E. DOWNEY. (Reprinted from the *Journal of Delinquency*, May, 1917, Vol. 2, no. 3.) p. 144-155.

NOTICE TO READERS

Until the close of the war, the size of the AMERICAN JOURNAL OF PSYCHOLOGY will be reduced twenty or twenty-five pages per number, making a volume of about five hundred pages.

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THE EFFECT OF AUDITORY DISTRACTION UPON THE SENSORY REACTION¹

By EDNA E. CASSEL and K. M. DALLENBACH

The effect upon reaction-time of intercurrent or 'distracting' stimuli has been variously reported. Most frequently the 'distraction' serves to lengthen the time; but sometimes it decreases it; and occasionally, after a brief initial disturbance, it leaves the time unaffected. No explanation can be found, so far as the published researches go, in the nature of the distractors as simple or complex, of this sense-modality or of that. It is possible, however, that their temporal relations are significant. Most of the distractors, in the experiments that showed an increase of the reaction-time, were irregular and intermittent; all of the distractors, in the experiments that showed a decrease or no change, were regular and continuous. This generalization is obtained by the comparison, not of different experimental series within a single investigation, but of separate investigations: in so far, and apart from the fewness of the investigations themselves, it is subject to doubt. It seemed worth while, nevertheless, to examine the effect upon the simple sensory reaction-time of distractors which vary widely in their temporal aspects. This is the specific object of the present study. We believe also, from a review of the experimental work done under 'distraction,' that many studies of the same special sort must be undertaken before the general question can profitably be discussed. We employed three distractors: one that was continuous

¹ From the Psychological Laboratory of Cornell University.

throughout the entire period of the experiment, *i. e.*, during the intervals of introspective report and of rest as well as during the reactions proper; another that was intermittent, beginning just before and continuing through the reaction; and another that was continuous for a set of ten reactions, but was interrupted during the periods of introspective report and rest. We shall term them henceforth the 'continuous,' the 'intermittent,' and the 'continuous-intermittent' distractors.

Observers. The observers were Miss A. Luce (L), and Mr. A. M. Palmer (P), advanced students in psychology; Dr. G. J. Rich (R), graduate fellow in psychology; and K. M. Dallenbach (D). L, P and R were unfamiliar with the object of the research and with the method of the reaction experiment; D was familiar with both. R and D served throughout the experiment; P began to observe in Jan., 1917, and withdrew from the University in April; L served only during the preliminary period of training.

Apparatus. Two rooms at opposite ends of the laboratory were used for the experiment. The experimenter, with the Hipp chronoscope and its accessories, was in the one room and the observer, with the stimulating and reacting apparatus, in the other.

The chronoscope was operated from make to break, and was controlled by Wundt's large control-hammer, in turn controlled by the Wundt chronograph. The control-hammer varied, according to the chronographic records, less than one five-hundredth. The average for a series of ten readings was $198 \pm 0.36 \sigma$. The chronoscope varied, according to the control hammer, less than one one-hundredth. This small variation was obtained by a careful adjustment of the springs and current that operated the magnets. The current was obtained from six dry cells wired in series. The strength of the current was kept constant by the aid of a resistance box and a rheochord. With the magnet springs in a fixed position and the current at 3.5 volts and 62.5 milliamperes, the constancy above stated could be obtained for any series of readings of the fall of the control-hammer.

The observer's room was darkened, in order that he might be free from visual distraction. The stimulus was the noise produced by the Wundt sound-hammer, which was placed directly in front of the observer at a distance of 40 cm. As in Evans' experiments,² the hammer was so adjusted that the only sound produced was from the impact of the hammer on the anvil. The ordinary 'telegraph' form of key was employed. The key was fastened to the table at a convenient distance to the right and in front of O. The forefinger was laid upon the edge of the button. Since a pressure of 400 gr. was necessary for contact, O exerted a slight pressure in order to hold the key down. The reaction was made by snapping the finger from the button.

Two flashes of light from a 2.9 volt electric globe were given before every experiment as the 'ready', 'now' signals. Their intensity was greatly reduced by four layers of black cloth. The globe was placed upon the wall in front of O, at a distance of 50 cm., and at the level of his eyes. The first flash, the 'ready' signal, was set to occur 3 sec., and the second, the 'now' signal, $1\frac{1}{2}$ sec. before the occurrence of the stimulus. As timed by the Hipp chronoscope they occurred

² Evans, J. E., *Archives of Psychology*, XXV, 1916, No. 37, p. 15.

$3265 \pm 32.6 \sigma$ and $1853 \pm 11.8 \sigma$ respectively before the stimulus. The first flash lasted $695 \pm 4.7 \sigma$ and the second, $706.8 \pm 2.8 \sigma$. These preparatory signals were automatically operated by the Meumann time sense apparatus and the Ludwig-Baltzar kymograph; the apparatus were in *E*'s room and were controlled from his desk by an electrical switch.

Procedure. The first problem was to familiarize the observers with the apparatus, and to train them in the mode and method of response. Directions for the sensory reaction were read to them at the beginning of every hour throughout the period of training.

The length of this period differed for the different observers. It was continued, except in the case of *L*, until the m. v. of any series of ten reactions was well below 10% of the average.

Although the reactions were computed in series of ten, every one was timed and separately noted; so that if a movement was made prematurely, or occurred under accidental disturbance, etc., the datum could be omitted and the experiment be repeated. The observer designated the occurrence of such faulty reactions by a push upon a bell-button which was on his desk at the right of the reaction key, and which was connected with an electrical buzzer in the experimenter's room.

After every ten reactions *O* wrote an introspective report, which was used primarily as a check upon his mode of reaction. If it indicated that his response tended to be 'muscular', the instructions were re-read: if it showed that they were sensory, the next series was given without further delay.

In the early part of the practice-period only 50 reactions (5 series) were made in an hour. As the observers became more proficient, more reactions were made; and finally 100 reactions (10 series) were obtained at one sitting. During this preliminary training *L* gave, in all, 173 series; *P*, 71 series; *R*, 74; and *D*, 46.

In the effort to obtain the required constancy of reaction, *L*'s training, as is shown above, was continued far beyond that of the other observers. To no avail, however: for her deviations were nearly as large at the end as they were at the beginning. We give below the data of 10 consecutive series from the early part of training, and of the 10 series taken on the last day of training.

Series from Early Part of Training			Series from Last Day of Training		
Series number	Av. Reaction- time	m. v.	Series number	Av. Reaction- time	m. v.
21.	327.5	92.10	164.	234.8	48.48
22.	321.1	83.06	165.	257.0	54.40
23.	366.2	34.54	166.	276.4	37.80
24.	252.1	63.20	167.	283.5	41.20
25.	314.5	53.10	168.	312.4	38.86
26.	294.0	40.40	169.	307.0	40.20
27.	287.7	38.08	170.	294.3	47.30
28.	262.6	40.20	171.	299.5	37.40
29.	244.5	94.10	172.	318.0	32.00
30.	302.7	55.80	173.	261.8	55.14
Average	297.29	59.46		284.47	43.27

It was evidently impossible for L, under our instructions, to maintain a constant attitude; and her service in this problem therefore ended with the practice-series.

Distractors. A metronome beating 120 in the minute was used as the 'interrupted-continuous' distractor. It was electrically controlled from the experimenter's desk, so that it could be released and checked before and after every distraction-series.

An electric bell was used as the 'intermittent' distractor. It was automatically controlled by the time-sense apparatus. Contact was made after the "Ready, Now" signal, about 1 sec. before the stimulus, and lasted for 2.5 sec. As timed by the Hipp chronoscope, the bell began ringing $1182 \pm 10.9 \sigma$ before the sound of the stimulus, and continued for $2584.9 \pm 19.8 \sigma$.

An electrically driven tuning-fork of 256 vs. was used as the 'continuous' distractor.

Plan of the Experiment. The 'interrupted-continuous' distractor, the metronome, was first employed. During these experiments the three O's served three times a week; 8 to 12 series, according to the length of time needed for the introspective reports, were obtained at a sitting. In the early part of the work, the experiments were so arranged that 4 normal series were taken with every 10 distraction series; later the number of normal series was reduced to 3. The normals were distributed equally often, in every case, to the first, second, third, fourth, etc., places. The work continued under these conditions until R and D had completed 100 series (1000 reactions) with distraction, and 34 and 33 series respectively of the normal type; and until P had completed 59 series with distraction and 29 normal series.

Next the 'intermittent' distractor, the bell, was used. The observers, R and D, served five times a week. Twelve series of reactions were obtained during every hour; only the first and last of these were control series. At the end of two weeks, when 100 distraction series and 20 control series had been obtained, the third distractor was employed.

With the 'continuous' distractor, the tuning-fork, 14 series were obtained during a single hour. The first 5 were distraction series, the next 4 control series, and the last 5 were again distraction series. The observers served five times a week; so that, at the end of a fortnight, 100 distraction series and 40 control series had been obtained.

TABLE II

Average and Mean Variation of the Reaction-times under Distraction and under Normal Conditions

Mode of Distraction	OBSERVER			
	P			
	Distraction series		Control series	
	Av.	m. v.	Av.	m. v.
1. Interrupted-continuous.....	192.79	23.73	173.80	20.43
2. Intermittent.....	.....	.....	.....	.....
3. Continuous.....	.....	.....	.....	.....

TABLE II—Continued

Mode of Distraction	OBSERVER			
	R			
	Distraction series		Control series	
	Av.	m. v.	Av.	m. v.
1. Interrupted-continuous.....	254.38	37.20	243.11	35.00
2. Intermittent.....	273.48	31.07	236.14	23.46
3. Continuous.....	264.65	22.48	255.78	21.35

TABLE II—Continued

Mode of Distraction	OBSERVER			
	D			
	Distraction series		Control series	
	Av.	m. v.	Av.	m. v.
1. Interrupted-continuous.....	206.12	24.85	201.73	23.59
2. Intermittent.....	220.27	27.65	203.68	21.14
3. Continuous.....	219.92	21.62	217.46	20.52

The general averages and the mean variations of the reaction-times, under the three modes of distraction and under control conditions, appear in Table II.

The reactions taken under distraction are longer, and their mean variations are larger, than is the case under normal conditions. This relation is constant for all three observers for all three modes of distraction, though the amount of difference, as is shown below in Tables III and IV, varies with the mode of distraction.

TABLE III

The Difference, the Probable Error of the Difference, and the Probable Correctness of the Difference between the Average Reactions under Distraction and those under Normal Conditions.

Mode of Distraction	OBSERVER						
	R			D			
	Dif.	P. E.	P. C.	Dif.	P. E.	P. C.	
1. Interrupted-continuous (metronome)...	11.27	1.975	100.00	4.39	1.280	98.97	
2. Intermittent (bell).....	37.34	1.628	100.00	16.59	1.528	100.00	
3. Continuous (tuning-fork).....	8.87	1.231	100.00	2.46	1.039	94.55	

TABLE IV
Difference in Mean Variation of the Reactions under Distraction and under Normal Conditions

Method of Distraction	OBSERVER	
	R	D
1. Interrupted-continuous (metronome).....	2.00	1.26
2. Intermittent (bell).....	7.61	6.51
3. Continuous (tuning-fork).....	1.13	1.00

Tables III and IV show the differences, for the three modes of distraction, in length of reaction-times and in size of their mean variations. These differences are smallest in the case of 'continuous,' and largest in the case of 'intermittent' distraction: the ratios are approximately 1.0:1.5:5.0. The uniformity of the results leads us to conclude that the 'inhibiting' effect of a distractor varies with its duration and regularity.

It might be thought that the inhibitory effect is dependent upon the qualitative as well as upon the temporal differences. But (1) in no investigation so far published does the effectiveness of distractors of even greater qualitative difference vary by so great an amount. And (2) D has found, in an attempt to obtain a graded series of distractors, that qualitative difference within a modality has very little if anything to do with the distractive effect.

Table III shows further the probable errors³ and probable correctnesses⁴ of the differences between the two sets of reaction-times. The probable errors are small, and the probable correctnesses are either of mathematical certainty or approach that limit.

Were we to summarize our results at this point, following the example of certain experimenters in the past, we should be led to conclude that the effect of the distractors is constant, and always in the direction of an increased reaction-time. This conclusion is, however, not borne out by the facts obtained from a fractionation of the data. Tables V, VI, and VII show the detailed results for the three modes of dis-

³ Computed by the formula: $P.E. \text{ diff. } A-B = \sqrt{(P.E.A)^2 + (P.E.B)^2}$. The probable errors of the averages were obtained by the formula: $P.E.M = \frac{0.8453}{\sqrt{n}}$ m.v. Evans (*op. cit.*, 35) says that he calculated his probable errors by the formula $P.E. = \frac{0.8453 M. v.}{n}$. We assume that the omission of the radical is a printer's error.

⁴ See Boring, E. G., *Amer. Jour. of Psych.*, XXVII, 1916, 315-319; also XXVIII, 1917, 454-459.

traction. The daily averages of the reaction-times for the distraction series and the control series, and the ratios of these averages, are shown opposite the numerals which appear in the first column under the caption "Groups of Reactions."

TABLE VI

Times of Sensory Reaction under 'Intermittent' Distraction (bell ringing just before and during reaction) and under Normal Conditions, and Ratios of these Times.

Groups of Reactions	OBSERVER									
	R					D				
	Distraction series		Control series		Ratio	Distraction series		Control series		Ratio
	Av. Reaction time	m. v.	Av. Reaction time	m. v.		Av. Reaction time	m. v.	Av. Reaction time	m. v.	
1	287.35	31.3	260.95	20.4	1.101	237.94	27.4	207.50	18.8	1.146
2	282.11	28.2	234.25	17.3	1.204	209.59	23.7	196.05	17.2	1.069
3	265.31	31.7	228.35	24.1	1.161	205.61	20.5	201.60	21.4	1.019
4	259.51	27.9	239.40	25.5	1.084	241.25	22.4	210.90	15.1	1.143
5	278.60	29.6	226.35	22.1	1.230	227.96	24.9	195.35	21.7	1.166
6	258.62	30.3	240.70	26.1	1.074	216.67	20.7	218.30	22.7	0.992
7	284.63	40.3	259.40	30.0	1.097	208.83	20.6	201.40	20.1	1.036
8	284.89	26.62	243.55	17.8	1.169	194.03	18.5	177.85	20.1	1.090
9	267.10	26.82	232.20	17.6	1.150	237.63	26.1	223.50	15.9	1.063
10	286.65	28.53	196.55	22.9	1.458	227.11	20.8	204.40	26.0	1.110

TABLE VII

Times of Sensory Reaction under 'Continuous' Distraction (tuning-fork sounding during periods of reaction and of rest) and under Normal Conditions, and Ratios of these Times.

Groups of Reactions	OBSERVER									
	R					D				
	Distraction series		Control series		Ratio	Distraction series		Control series		Ratio
	Av. Reaction time	m.v.	Av. Reaction time	m.v.		Av. Reaction time	m.v.	Av. Reaction time	m.v.	
1	282.44	29.3	254.80	26.7	1.108	230.44	16.9	236.40	18.4	0.974
2	262.04	23.7	270.40	21.5	0.972	217.93	21.3	198.20	21.6	1.099
3	255.61	26.6	257.95	26.0	0.990	215.05	27.0	214.90	21.2	1.000
4	266.20	26.1	265.30	25.8	1.003	202.25	21.0	208.15	16.1	0.971
5	238.48	21.7	245.10	21.0	0.964	207.60	20.7	208.97	20.8	0.993
6	256.60	23.2	240.57	24.3	1.066	225.71	17.6	217.40	18.1	1.038
7	260.55	21.5	210.50	21.5	1.237	217.04	17.3	221.90	18.5	0.978
8	275.83	24.2	287.70	24.8	0.958	222.56	17.0	215.90	14.0	1.030
9	267.02	27.3	258.30	24.2	1.033	233.98	14.3	238.60	13.8	0.980
10	281.31	23.2	267.70	23.1	1.050	226.69	16.1	220.75	17.5	1.026

These tables show that no distractor operates constantly, or always in the same direction. The variability is large, and extends (with but a single exception) both to the positive and

to the negative sides. Table VIII gives the frequency of this alternation for both observers under the three modes of distraction; *i. e.*, shows the number of days on which the average distraction-reaction was greater and less than the average normal reaction.

TABLE VIII

Number of Days on which the Average Distraction-Reaction was Greater and Less than the Average Normal Reaction

Method of Distraction	OBSERVER			
	R		D	
	Greater	Less	Greater	Less
1. Interrupted-continuous (met.)	9	5	9	4
2. Intermittent (bell)	10	0	9	1
3. Continuous (tuning-fork)	6	4	5	5

Though in case 2 R offers an exception to the rule that 'distraction' sometimes facilitates reaction, the variability of the ratios has a wider range for this distractor than for the other two. It extends from 1.074 to 1.458; whereas for the metronome it is 0.927 to 1.230, and for the tuning-fork 0.958 to 1.237.

These results, which corroborate those of Evans,⁵ show the

⁵ *Op. cit.*, 36-40; 72-80. Evans' six observers all gave instances of facilitation. A's reaction to light, under a light-distraction, was inhibited 20 times and facilitated 19 times (Evans, p. 36, says 18 times; but the table, p. 72, shows 19); under a sound distraction was inhibited 9 times and facilitated once; and under a touch-distraction was inhibited in all 10 times. B's reaction to light, under light-distraction, showed 16 cases of inhibition and 3 of facilitation; under sound-distraction, 4 cases of inhibition and 4 of facilitation; and under touch-distraction, 7 cases of inhibition only. Observers C and D reacted to a sound-stimulus. For C, only 2 of the 37 cases of sound-distraction, and none of the 9 cases of light or the 7 cases of touch-distraction, showed facilitation. D showed facilitation in only 1 out of 17 cases of sound-distraction. (Evans, p. 24, says that the reaction to a sound-stimulus with sound-distraction was followed, in the cases of C and D, by reaction to sound with light-distraction, and then by reactions to light with touch-distraction. The results for D's last two sets of reactions are not quoted; and the table p. 76 that gives C's results for the last set of reactions shows that the stimulus was a sound instead of a light.) The results of observers E and F, more nearly parallel our own; for these observers were trained in the method of reaction with a view to elimination of the effect of practice from the distraction-series. E, under sound-distraction, gave 10 cases of inhibition and 1 of facilitation; under light-distraction, 9 cases of inhibition and 5 of facilitation; and under touch-distraction, 5 cases of inhibition and 4 of facilitation. F, with a sound-distractor, gave 9 cases of inhibition and 1 of facilitation; with a light-distractor, 3 cases of inhibition and 4 of facilitation; and with a touch-distractor, 4 cases of inhibition and 3 of facilitation.

fallacy of arguing from averages. The effect of distraction is equivocal; it sometimes increases and sometimes decreases the reaction-time.

Evans regards the reactions that show 'facilitation' as exceptional and atypical cases, due to lack of interest, poor adaptation, overtraining, staleness, confusion, inattention, and chance. He therefore omits them from consideration, and concludes that "the distractions were true distractions," which "affected the reactions by making the time longer."⁶ The omission of these data does not, however, follow logically from the explanation offered of them; the explanation suggests rather that the effect of distraction upon reaction is dependent upon the observer's attitude.

That the 'exceptional cases' should not be omitted is shown, indeed, both by the frequency of their occurrence in Evans' and our own results, and also by the fact (Tables V, VI, VII) that their probable errors are as small and their probable correctnesses as large as those of the cases that indicate inhibition. For the sake of brevity, we give the actual figures of only one *O* under one distractor. We choose the instance of *D* in Table VII, where the distraction of the tuning-fork brought about an equal number of cases of inhibition and facilitation. The differences between the daily averages of the distraction series and the control series, the probable errors, and the probable correctnesses of these differences, are set forth in Table IX.

TABLE IX
Differences between D's Daily Averages under the Distraction of the Tuning-Fork and under Control Conditions, with the Probable Errors and the Probable Correctnesses of these Differences

Groups	Dif.	P. E. Dif.	P. C. Dif.
1	-5.96	2.861	92.07
2	+19.73	3.415	100.00
3	+0.15	3.658	51.07
4	-5.90	2.803	92.17
5	-1.37	3.309	60.89
6	+8.31	2.857	97.47
7	-4.86	2.895	87.14
8	+6.66	2.373	97.09
9	-4.62	2.217	91.97
10	+5.94	2.723	92.92

The one set of figures is plainly as valuable as the other; neither may be neglected. In other words, the data are heterogeneous: a conclusion confirmed by Tables V, VI and VII, which prove that the differences between the two kinds

⁶ *Op. cit.*, 40, 53.

of reaction from day to day are greater than the differences for a single day. The daily averages, on the other hand, are homogeneous, as the small variations clearly show.[†]

We cannot take recourse to the effect of practice. That this effect was eliminated is shown implicitly by Tables V, VI and VII, and explicitly by Table X. This table gives the averages and mean variations found in both halves of the experiments for each observer under every mode of distraction. The values appearing under 'Distraction' are the averages and mean variations of 500 reactions; the number of reactions represented in the values under 'Control' varies. With the 'interrupted-continuous' distraction, the value for the first half was obtained from 190 reactions for R and 180 for D; that of the second half from 150 reactions in each case. The values for the other two modes of distraction were derived from 100 and 200 reactions respectively.

TABLE X
Averages and Mean Variations of the Distraction and Normal Reactions for the Halves of the Experiments

Modes of Distraction	OBSERVER							
	R				D			
	Distraction		Control		Distraction		Control	
	1 half	2 half	1 half	2 half	1 half	2 half	1 half	2 half
Inter.-Con. (Metronome)	247.11 ±30.25	261.63 ±26.91	248.23 ±32.63	238.23 ±25.13	210.21 ±20.43	201.55 ±17.18	200.80 ±20.08	202.17 ±15.17
Intermittent (Bell)	274.37 ±29.76	276.38 ±30.55	237.86 ±23.89	234.48 ±22.90	224.47 ±23.76	216.85 ±21.32	202.28 ±18.85	205.09 ±20.97
Continuous (Tuning-fork)	260.95 ±25.48	268.26 ±23.88	258.71 ±24.20	252.95 ±23.58	214.65 ±23.30	225.19 ±16.46	213.32 ±19.62	222.91 ±16.36

The first halves of the distraction-series are, with all three modes of distraction, shorter for R than the last halves. The relation is so constant, and the differences and the probable correctnesses of the differences are so large, that we have evidence not only that practice was eliminated, but also that there was a change of attitude, from interest to boredom. The control series, it is true, seem at first inspection to show the effect of practice; the second halves are shorter than the first. It is to be remembered, however, that the control series were taken less frequently than the distraction-series. We

[†] The mean variations given in these tables (Tables V, VI, and VII) are not the averages of the mean variations of the ten series, but are the mean variations from the averages of 100 reactions.

may infer, then, that on the introduction of the various modes of distraction, R was interested in the new conditions imposed upon him. After 500 or more reactions under the same conditions, his attitude changed; he reacted less efficiently. At first, while R was interested in the reactions, a change from distraction to control did not greatly affect the reaction: the averages of the first halves of the distraction and control series are very close. As habituation and tedium set in, the change from distraction to control became more and more marked; until the control reactions, in contrast with the monotony of the distraction-reactions, were performed more efficiently.

The results for D are the exact converse of those for R. Where R shows an increase in the average reaction, D shows a decrease, and contrariwise. The explanation given for R's results will not hold for D's, though we find in D's results evidence of the same change, habituation and consequent shift of attitude. This evidence is presented, first, by the control series, the averages of which show a steady increase with the advance of the experiment; and secondly by the large and sudden increment in the averages, under the third mode of distraction, of both the distraction and the control series.

These external indications of change of attitude should be borne out by the observers' introspective reports. These reports, excerpts from which follow, do in fact confirm the external evidences, substantiate Evans' suggestion, and enable us to account for the equivocal results of distraction and the heterogeneity of our data.

R reports, on the day on which the bell showed the greatest effect of inhibition: "The bell seems to make the reactions more difficult, seems to make the sounds come into consciousness more slowly. Am confused"; and on the day on which it showed the least effect: "Sometimes the two kinds of series [the control and the distraction] seem exactly alike, while at other times they seem so entirely different as to be incomparable. Today they seem alike, that is, I 'feel' that my preparation is the same and that I am giving the same sort of reaction in each."

D reports, when the bell was objectively most effective: "The bell occupied the focus of consciousness; seemed like a blanket spread over all other processes. . . . the reaction was confused and unsteady"; and on the day when it was objectively least effective (i.e., produced a facilitating effect): "During the distraction-series attention was concentrated on the sound of the stimulus; the bell did not bother me, but actually kept my mind closer to the task. The sounds of the stimulus were as clear during the distraction-series as during the control, where attention was discursive. Seemed unable to inhibit certain associative trains during the control series, whereas they were inhibited more or less involuntarily during the distraction-series."

R reports, during the first series of experiments under distraction by the metronome (the series that gave a ratio of 0.945): "At first I found that the distraction of the metronome upset my determination for sensory reaction, and I think I tended to give muscular reactions. The metronome is very unpleasant." That he did give a different kind of reaction is shown, in comparison with the normal and the other distraction-series that followed, by the extremely low average for that day. He reports after a normal series on the second day (ratio of 1.052): "The reaction without the metronome seems to be more passive than with it. When the metronome is sounding, I have actively to attend away from it. When it is not going, I just take the stimuli passively, and react to them as they come." After a distraction-series on the 6th day (ratio of 1.011): "While there is still some effort necessary to attend away from the metronome, this effort is getting less. In this series, my attitude was only slightly different from that of the preceding [a normal series], yet it was more effortful, more active." And again, after a normal series on the 11th day, when the distraction and the normal series were practically equal: "I cannot notice any difference between these reactions and those with the metronome going. I try to take them all in a passive attitude, just waiting until the stimulus comes without straining for it"; and after a distraction-series on the same day: "I seem to fall quite naturally into the 'set' for reacting with the metronome. It 'feels' natural, and I cannot see that it distracts me. On the contrary, it is rather a steadying agency. In the preparatory interval, its sounds drop out of consciousness."

On the sixth day of the distraction with the metronome, the day with the greatest ratio of the metronome series, D reported after a distraction-series: "Attended actively to the sounds of the hammer, which, when they occurred, varied from clear to very clear. The sounds of the metronome were ever in consciousness. They were rather insistent, varying from vague to clear, and at times becoming maximally clear." On the tenth day, the day with the smallest ratio of the entire series (0.92), D reports after a distraction-series: "Attended passively to the sounds of the hammer, and when they entered consciousness they were maximally clear. The sounds of the metronome were vague during the interval between experiments, and at the times of reaction they were totally obscure."

R reported after a distraction-series during the first observation under distraction by the tuning-fork: "The fork tends to attract my attention. Some effort is required to attend away from it. As a result I attended more to the reactions, and the only thing present in the fore-period to be attended to is the kinaesthetic strain sensations." On the fourth day, when the averages of the control and distraction series were about the same, he reports after a control series: "The stoppage of the fork seems to have no effect. The attitude is just the same with it as without," and on the fifth day: "The fork is not in the least a distraction. It makes no difference in the reactions." Again on the seventh day, the day that shows the greatest difference between the distraction and control reactions, R reports after a distraction series: "Am very sleepy, the monotonous hum of the fork increases the feeling."

D reports after a distraction-series during the first observation under distraction by the tuning-fork: "The tuning-fork very vague, most of the time it is obscure. The sounds of the hammer are maxi-

mally clear. Attended passively and without effort"; and after a distraction-series during the last observation: "The sounds of the hammer were maximally clear; all other processes, in background of consciousness, were vague and obscure."

We have, then, abundant evidence that the attitude of the observers was not constant. It changed from the distraction to the control series, and from day to day. It is only roughly correlated with changes in reaction-times. The correlation, however, is sufficiently close to allow us to conclude that *the effect of a distractor upon the sensory reaction is dependent upon the conscious attitude of the moment.*

We have no adequate data whereby to correlate the different attitudes and the rates of reaction under the conditions of distraction and control. Our observers were not instructed to report upon attitudes, and the information they gave was merely incidental. Since one of the experimenters was serving also as observer, the results were not worked over until the completion of the experiment, and we did not discover the significance and desirability of a report of attitude until it was too late to rectify the omission. From such data as we have, however, it seems reasonable to suppose that the distractors have no effect upon sensory reaction under a passive attitude, while they lengthen the time of reaction under an active attitude. The clearer, the more 'conscious' the distractor, the more active is the observer's attitude, and the more do the reactions differ from the normal; the more obscure, the less 'conscious' the distraction, the more passive is the observer's attitude, and the less does the reaction differ from the normal.

The bell showed the greatest effect of inhibition. The attitude in every case except one was more active during the distraction-series than during the control series; the reaction in every case except one was longer for the distraction-series than for the control. The exception (which we have noted) occurred in D's sixth observation. The apparatus on this day was found broken, and D was obliged to repair it before turning to the observation. During the experiments that followed, thoughts of the apparatus kept intruding themselves. D reports: "I seemed unable to inhibit certain associative trains during the control series, whereas they were inhibited more or less involuntarily during the distraction-series." The distraction 'facilitated' because, under these conditions, a more constant and more passive attitude was maintained than was possible under the conditions of the control series. Even here, therefore, where we have facilitation, we find that conscious attitude will account for the results.

The tuning-fork showed the greatest effect of habituation. After only a few experiments, both observers reported that the sound was very obscure, and that the attitude was practically the same for the distraction-series as for the control series. The differences between

the reactions are no greater than those between the various distraction-reactions, or those between the various control reactions; so that the reaction-times for the two series may be regarded as practically identical, and the variations as due to chance.

Between these extremes lie the results from the metronome, which show the effects of inhibition, facilitation, and habituation, and which may all be explained in the above manner.

SUMMARY AND CONCLUSION

1. The effect of 'distraction' upon the sensory reaction is equivocal. The distractor may inhibit, and lengthen the reaction; it may facilitate, and shorten the reaction; or it may become habitual, and have no effect at all.

2. The effect of the distraction is dependent:

- a. upon the temporal relations of the distractor, and
- b. upon the conscious attitude of the observer during the distraction.

3. The distractor most resistant to habituation is the intermittent; that least resistant is the continuous.

4. The passive attitude is conducive to a constant sensory reaction of normal length; the active attitude to a slow and variable reaction.

In the light of these results we can largely understand the lack of agreement among previous investigators of the effect of distraction. Distractors of different temporal character have been employed; and, what is still more significant, the observers' attitude has not been standardized, so that their reactions were made under various dispositions. That the importance of the conscious attitude in this connection has not been earlier detected, we believe to be due to the fallacy of conclusions based upon gross averages.

A MEDIUM IN THE BUD*

By G. STANLEY HALL

Some ten years ago, before Freud was much known in this country, and about the time I was making some observations on Mrs. Piper with Dr. A. E. Tanner,¹ my colored man, one morning, announced a girl to see me, who did not wish to give her name and seemed "a little skeered and 'cited," and who said it was very important. On going down, I found a very attractive blonde miss of twenty (as afterwards appeared), who with a rather trembling and almost inaudible voice and changing color said that she had been sent to me with a very important message from the spirit-land. I explained that I was on my way to a class and could not stop to receive the message then. She showed some disappointment, but it was finally arranged that she should come to the city from the neighboring town where she lived, the next day, and very readily consented to my proposal that I invite a mature lady and gentleman who were interested in such things (Dr. Tanner and Dr. Edward E. Weaver, author of "Mind and Healing") to be present, to observe, question, and take notes. At the appointed time she appeared and wished to sit in a rocking-chair, with a pillow for her head, a glass of water, and a foot-stool; and very soon the obliging spirits came.

One of the most interesting things about the case throughout was that her mediumship was in so undeveloped a stage that the girl never, for a moment, lost herself, nor was unconscious of what the spirit (whose presence was indicated by a change of voice, which always tended to become her own as the seance proceeded) said. Moreover, the incipency of her stage of mediumistic development appeared also in the fact that very many of the deliverances from the other world were tentative, often in the form of questions; and she had quite an arsenal of phrases by which, when her own suggestion was corrected

* Perhaps the pith of the story of this case is found in its very last stage where the whole slowly-evolved structure of mediumship was abandoned.

¹ See her "Studies in Spiritism" (New York, Appleton, 1910, 408 p.), especially Chapter XVII, "A Medium in Germ," where this case is very briefly sketched.

or even reversed by us, she would accept our hints and abandon those of the spirits. ("Yes, perhaps the hair was dark but the sun shining on it made her seem a blonde." "The voice was so far away that I could not hear it distinctly and probably it was as you say." "The spirit is weak, came from so far, and for the first time, that I did not get the impression clearly, and now I see it was wrong.") In fact, everything indicated that while the girl, whom we will call Annie because that was not her name, had had to muster much courage to come to me and avow her mediumship, nevertheless her belief in it all was still in a more or less hypothetical stage, certainty alternating with doubt, so that, as the sequel will show, the abandonment of it later caused no great disappointment.

Before describing the sittings and their results, it will be best to outline the conditions under which this nascent mediumship arose, in the light of knowledge which we acquired later, as follows. The girl lived in a small country town, quite apart from the village; was bright, impressionable, perhaps unusually given to adolescent reveries, and was the constant companion of a mother said to have been born with a "veil," and to be more or less of a seeress, communing with spirits. The mother seems to have been estranged from her husband; and mother and daughter, partly because sensitive to gossip occasioned by this separation, had gradually withdrawn even from the church, the chief source of social life in such a place. Hence the isolation of each from the society of all others brought them into almost unprecedentedly close relations to each other. Without the higher education, both were capable, fond of reading, perhaps the mother more about spiritism, the daughter about astronomy, geology, and especially history, some characters of which she later fancied used her as a medium. She had read sporadically much in Chambers' Encyclopedia, and her active mind, on the basis of the facts she had gathered, had worked out certain conceptions in regard to the origin of the earth, of life, the soul, the nature of God, the future life, and the organization of society, so that solitude favored day-dreams of greatness, as we see in the life of Joan of Arc but in a very different way. The more tenuous such dreams, the more magnificent they are, and it is not strange that a loving mother, who had no other object of affection than her daughter, and had access to the inmost spirit of her child's life, should watch every fluctuation of mood and every spontaneous concept, every gesture and expression of her face, as an indication of spirit influences.

Not until she was seventeen, did the girl see a real medium;

and then this experience was such as to make her dreams a little more definite as visions, and her reveries were moved several notches up the scale toward becoming realities. The medium they visited not only gave people messages from the dead but insisted that the spirits desired to control the girl herself and had a great work for her to do. Soon, in the very sympathetic attitude of her home, the spirits did come to the girl, indistinctly at first, in the realm of vision, and then in that of audition; so that the girl grew somewhat credulous of clairvoyance and clairsaudience, although apparently always with reservations that held her from plenary conviction. Once, there was a vision of a scene which she was impressed was her father's boyhood home; and again a suggestion of the proper hygienic treatment for a sick friend sprang up in her mind autosuggestively. All this was in the family circle, with no thought, even on the mother's part, of using these gifts for financial gain. There can be no doubt that in the later teens the spiritual society, sometimes with the great of history and also with spirits otherwise unknown, of whom there is quite a list (Bertha, Esther, Alphine, Allof, a Martian who had never lived on earth, and many others), was becoming, on the whole, more real or veridical. The very fact that her conviction of their objective existence was not complete but was arrested quite short of any kind of materialization (for both the girl and her mother scorned raps and every kind of apparition), favored abandonment to her wildest aspirations, which could, of course, become exalted somewhat in proportion as they remained tenuous and hypothetical.

Hence we have in this case already some features of that exquisite and romantic effervescence of soul so common to this stage of life, of which Kohl in his "*Pubertät und Sexualität*" (Würzburg, Kabitzsch, 1911, 82 p.) has culled from the large literature upon this subject so many characteristic illustrations. So Annie finally entertained greater spirits, Lucifer, to whom she gave the pet name of "Zezy," also Allof, master of the elements. Lucifer was the prince of all the angels, and to him and his immediate subordinates God had entrusted the conversion and reformation of the world, to fit it for Christ's second coming. All was prepared among the heavenly hosts for the fulfillment of God's far-reaching plans, and these agencies to whom they were now entrusted, in pursuance of the divine will, were about ready to inaugurate this new dispensation. But how? Not by opening the heavens and leading the hosts of heaven down to earth, but there would perhaps be some divinely chosen medium, perhaps a young girl, who

would be shown hidden ways to the highest knowledge, and who might eventually be an agent through whom a new redemption should come to earth, which would unite perfect knowledge and perfect will.

These reveries, no doubt very faint and flitting at first, would almost inevitably, in such an environment and in such a personality, gradually come to focus on herself, conspicuously modest, retiring, sweet, and attractive as she was, for the law of compensation is always at work. No doubt she and her mother long pondered these things, wondering what they could mean, and only little by little did the wonder become focalized and did some degree of conviction and sense of commitment to the guidance of these wise and beneficent spirits occur. She is only the instrument, can only listen and obey. Thus a rich fantasy, stimulated by the warmest maternal sympathy, favored the highest flights of fantasy, and the world of imagination grew inversely and more or less as a surrogate of the normal expansion of interests which were lacking in the environment. Both her disposition and her uncertainty held her back, while her mother's constant, if gentle, urgings, impelled her forward, to settle the great question of whether or not all this inner psychic structure was veracious or made only of the stuff of dreams. This, at least, was our interpretation of what had led up. She had long pondered, and it was in this stage of her development that she chanced to see in the daily papers an account of lectures on the psychology of spirit phenomena that had been provided to be given at Clark University under my direction; and hence she sought me out.

The above represents all the motivation that we detected in the early seances, in the amazingly frank descriptions of "this girl," in the past and present, by some of the spirits that possessed her, and in data that we gathered from various other indirect sources. Surely it seemed that here we have no trace of any sex motivation, and in this naïve and innocent soul the deliverances of the early seances contained nothing whatever to suggest ever so remotely any erotic factors; nor, indeed, anything else abnormal. On the other hand, the center of interest to us seemed to be in the far-flung and exceptional magnificence of the idealistic imagery, which makes the teens the golden age of imagination. The circumstances that surrounded the girl were homely and obscure, and in the neglect and critical attitude of neighbors and country gossip, she had saved her sense of the value of her personality by evolving an inner world that more than made up for all that she missed from the outer reality, from which she had so

effectively taken flight. No other members of her family, save her mother, seemed to have been dominant in her development to any appreciable degree.

Coming back now to her first seance with us, never before, save in the presence of her mother, had she communed with ghosts. Now, in the presence of three university people, who sat in a crescent about her, waiting to hear and record what Lucifer was to reveal to the world, we can well imagine that her bosom must have heaved with a sense of achievement already, and that in her own conscious personality, which was never for a moment obscured, she must have reached about the acme of conviction in her transcendental guise and in her own mediumship. Even the musings of her twilight hour, of which perhaps even her mother had not been a full confidante, took bolder outlines, and the imaginary companions which she had chosen sustained all her falterings. But oh, the naïveté and insouciance of sacred simplicity! This and her own charming personality was able to keep the manner and tone of her little circle respectful and even sympathetic, and enabled them to jot down many of her dicta, which must have brought her own faith in spirits to its very culminating point. To have us record these crude platitudes in regard to the heavenly hosts, God's plans for man, and the nature of the nebulae, the conditions upon Mars, the development of man and mind, all given out in the most simple, unabashed, and unconscious way, as this soul of young womanhood was laid bare, until we almost shrank from listening to intimate revelations about the most confidential matters which the spirits told us, in regard to not only the outer but still more the inner history of "this girl,"—all this we saw in the early sittings she was accepting as evidence that her mission to us was succeeding beyond her wildest hopes.

Her bottom purpose grew more and more clear to us; viz., to so convince us that she had a revelation for the world, that we should summon a larger group of the most eminent scientific experts to listen, question, test the truths the spirits were revealing through her, that the world would come to realize their existence. Her ambition was to be an apostle of spiritualism in the world, and to be recognized as such. She was nothing; the cause was all. Even the unfavorable revelations about herself seemed at first only designed to bring out the power of the spirits, all the more because of contrast with the insignificant medium they had chosen. If they could do this with such a girl, what might they not do with those in every way her superior?

Our only attitude, therefore, was at this stage to express frankly to her, and also to her control, our doubts. We demanded revelations of something known only to one or another of us personally. This was pronounced fair and many attempts of this sort were made. I was said, *e. g.*, to have drawn my baby brother in a box cart and hurt him, and although he was younger, he arose in his wrath and gave me the surprise of my young life by a drubbing. I was said to have lost a cigar behind a desk; as a baby to have performed antics with my mother's bustle. The spirit of the founder of the university was rung up, and although he came reluctantly and could remember only in the vaguest way (because he had other greater things to concern himself with in the other world), he at last recalled a number of episodes and conversations with me. The girl, or the spirit control, which was only a somewhat different level of her own personality, seemed to have a certain degree of implicit confidence in every scene and image that popped into her mind. It must have been true somehow, somewhere, out of me; otherwise it would not have occurred. Along with this conviction there went also, in the incipient mediumship of which we have here so rare an illustration, the most acute suggestibility, so that every inflection and expression of the face of each of us interlocutors modified and even negated any of these rank spontaneities in the medium's mind. Our attitude was not to affirm or deny each suggestion or test as she presented it, but rather to assume an interested and waiting air, and jot it down; so that her environment might be on the whole sympathetic, as was necessary if the sessions were to develop aright. The least expression of scorn or any blank negation would have ended everything. As the sessions proceeded, various tests were discussed. The medium was inclined to believe at first that her controls could tell how many oranges of a basket had been poured on a table behind her, a test, the successful accomplishment of which a five-thousand dollar prize had been offered. But later, after preliminary experiments at home, Annie reported that this could not be done.

Reading sealed messages was not impossible, but not quite worthy of the attention of so lofty a spirit as Lucifer; while levitation and raps were still less so. After a number of sessions, the persistence of "Zezy," however, became very urgent that we should declare whether or not we would call a conference of savants, and he threatened to take the medium to another circle, less incredulous, and leave us unless we were about ready to act. The medium, however, was more

ready to see the force of our insistence that scientific men would be more rigorous than we, and that if we were not yet convinced, they would be still less so and the end would be disastrous to the cause, to say nothing of the medium. Thus in the early stages there was nothing to suggest anything Freudian, but there was simply the earnest desire to convert the world and prepare it for a new dispensation.

At this stage several courses seemed possible. (A) We might continue an attitude of interest and sympathy, perhaps enlarging our circle to meet the medium's wishes, and to encourage her to do her best with one or several of the controls from among those she had evolved herself or which we had invented (for the origin of them seemed to make no difference). Under the stimulus of the experience thus provided her, we might, had we the time, patience and purpose, have helped her evolve a very high quality of so-called mediumship, and launched her upon a career of self-deception and of being investigated by psychic researchers, and she might thus have become in a sense a rival of Mrs. Piper. The already incipient change of her psyche might have gone on until Annie and "Zezy" parted company; until S. B. had taken on the lineaments of a third personality, while we observed and reported the stages of all this processional. This girl's mediumship seems unique in that it did not come suddenly or involve oblivion of one state in another, but for memory purposes there was an almost complete overlapping. This first course we could not pursue for we deemed it unethical, and not in the interests of the patient in this case, although let it here be distinctly said that there are undoubtedly cases where such a projection and materialization of certain unconscious impulses of a patient might have a high therapeutic value. The mediumistic state should never be cultivated by the physician unless he is absolutely certain that he has the reductive. Like transfer, this fixation upon a spirit thought objective may be helpful at a stage, but its processes need far more study.

(B) We might have taken a standpoint typically represented, perhaps, by the hard-hearted practical physician, and told her bluntly that her spirits were delusions, and warned her of her danger of neuroticism, of self-deception, of entering upon a career of charlatanism, playing upon the credulity of those who have lost friends, etc. She could hardly follow this course, if for no other reason than because it would have involved a rude break with her mother, for she was not yet ripe. It proved in the sequel still more fortunate that we

did not take this course, because it would have involved the shock of another rupture, viz., with a lover, although his existence was not yet suspected by us, as will be seen later.

(C) The third course, which we chose, was to go on and evoke all there was in this mediumistic diathesis to the very uttermost, until both she and we could see all there was in it, and then when it was fully documented, to try some kind of a Dubois persuasion cure. It might prove all a romantic bubble, which would burst of itself if sufficiently inflated, or again, perhaps a new way, as yet unperceived, might occur to us as we proceeded.

As on the whole both the medium and we were ready to go on, we asked for a few imaginary spirits that we had designed and given fictitious names to, particularly one S. B., who it was intimated was my niece, a girl graduate, attractive, interested in social settlement work, etc., and whom at last "Zezy" brought to us. She had come four million miles and resisted persistently all attempts to tell anything about me, merely accepting rather shyly most suggestions of incidents that I feigned to remember with her, a young man, a boat-scene, a picnic, a gold watch and chain I had given her, a quarrel, a green pocket-book, a violin or guitar or something with strings, which the medium accepted the suggestion was really a mandolin, though she finally admitted she was mistaken about all this, but said it was another girl, J. B., also a fictitious character, or perhaps M. C. or H. B., other of our inventions. But S. B. could not get away from the medium herself, and she proceeded to reveal gossip about the various members of her family, some of which was in the highest degree discreditable, the medium meanwhile, although understanding perfectly everything and showing a certain amount of shame and confusion, flushing and breathing deeply, not only at things said about others but entering upon a more or less detailed story of the love-affair of the girl, and stating roundly that her motive in all this mediumship was to get a hearing at which a man with whom she had fallen in love could be present and would be impressed, as she wished him to be, with her sagacity, ability, importance, etc. S. B., in fine, gave us to understand that the many and very serious clouds which had rested upon the girl and her family had prevented the lover from declaring himself, had made him reluctant to accept the girl as a pupil in the art he taught, and that if we could only arrange to invite him with the savants to see the girl in the midst of her seance, with the wise men taking notes, all his scruples would be

overcome and he would hasten to avow the love which he undoubtedly felt, but had been hindered from expressing.

Now the whole situation stood forth in a new light. An erotic motive, of which there had hitherto been no hint, appears to have been the dominant one throughout. The man, apparently in every way worthy and without in the least having committed himself, must be won, and the suggestion was that all this incipient mediumship, with the conceptions of greatness, was a dream fantasy that had sprung out of the unconscious from the fundamental motive of winning a mate. In previous seances it had become more and more apparent that the girl had already cherished the secret dream that she was to be a new holy mother, that the new dispensation was to be inaugurated by a child whom she was to bear, so that all the issues of history were to focus in her motherhood. The world was to be re-redeemed by the fruit of her own body, and it seemed not improbable that she justified her own subtle methods of making advances in this initiative to win the man she loved, because the issues were as momentous as the salvation of the world. He was doubtless to be the father of the new Messiah and perhaps if all her wishes were carried out, he would listen to the call and the motive of duty might supplement that of love in impelling him to woo her.

Now we had a new situation, a new goal, and a new motivation revealed. These highly colored accusations of S. B. (which were really self-accusations, because Annie knew well all that her control said), and the more or less unconscious purpose of the control (representing the more or less unconscious layer of the medium's ego), were to enlist our sympathy with a greatly misunderstood and misrepresented maiden, whom malicious and truculent gossip had discredited, to right herself in the eyes of one to whom she had given her heart with all the abandon of first love, and with an unusual idealism. An audience of savants listening to her inspired revelations was the dramatic scene she had evolved in her fancy, as the means of his conversion from criticism and aversion to admiration and love. The more squalid the details of her physical and moral environment, the more glorious her triumph. Her father was made out a criminal, and even her mother was sacrificed to the surprising extent of having been the subject of the most vicious scandal, with many circumstances of times, places, names, etc., which we suppress. Thus for S. B. the girl was made a most pathetic and innocent victim of an ostracism that was cruelly unjust and

nothing less than pathetic. At times, as S. B.'s revelations proceeded, we were almost aghast, tried to stop the swelling tide, but in vain; Annie felt it coming, for she had flushed, breathed deeply, and showed acute agitation as the *chronique scandaleuse* proceeded, in which she was both audience and actor. She could even remember and report most of this matter in her normal state afterward. The motive of it all grew to seem to us more and more a pitiful and almost despairing attempt to arouse our pity, so that we might invite the scientists to right the wrongs of the girl, or if not, we might devise other means of bringing her lover back. Indeed, we did later discuss other possible means of bringing them together for an interview, in which both S. B. and Annie were eagerly interested. We said if he was invited to a conclave of scientific men, he might feel out of place, wonder why, and finally perhaps suspect that she had planned it all to attract him, and thus turn away feeling that it was a subtle but perhaps somewhat unmaidenly method of making advances.

Finally, we suggested that perhaps he was not a believer in spiritism. This was manifestly a new and somewhat startling proposition. We followed it up by intimating that possibly he might have a deep prejudice against it, as some people certainly did, so strong that even an imposing array of professors sitting at the medium's feet could not suffice to overcome it. This ended the session, and she went away saying that she had reason to think that he was a believer. She left subdued, however, and pensive, and no longer demanding the high audience her control had been so insistent about at previous sittings. She wondered if it would be feasible to find out what he thought of spirits.

This girl evidently loved her own diathesis and the experiences it brought, and this seems generally to be the case. When we ask why, it is not entirely sufficient to say that the priestcraft motive has brought respect and power in the past because of its function of mediating between two worlds. This has, in the past, given it great charm and may still contribute to the attractiveness and exhilaration of this state. These experiences also doubtless stimulate and enlarge the ego by widening experience, but there is another source of fascination, not yet, to be sure, fully analyzed, but which is found in the love of the utter abandon involved in this state. Inhibitions are thrown to the wind. While the normal ego is controlled, the control can let itself go and express the very deepest and most secret things in the soul, often with

a frankness that ordinary social conventions would make impossible. Thus there is a sudden freedom from responsibility and sensitive, shrinking, repressed natures, who would above all things dread to shock or violate convention in phrase or manner, are freed from the necessity of even being agreeable or primly proper, which must often become irksome, hedged about as they are by so many senseless taboos. In the trance-like state these are all removed, for the nonce, from one level of her soul, and she can blurt out things which ordinarily maidenly modesty would never permit her to say or hear. Such tender and delicate girls often feel themselves possessed by some rugged, potent and often uncouth male spirit, and delight to swagger in diction and manner, to be blunt, slangy, to uncork and vent elements of conduct and psychic action-types for which nothing in normal experience gives such opportunity or such incentive. The girl is thus using new powers and in some sense may be the better for it.

The instinct which often seems to dominate is to drag up into the light of day their own most private thoughts, feelings, aspirations, imaginations, which in the normal state would be intimidated into silence, if not repressed into the unconscious. Her soul is generally hidden, but now it is open like a St. Martin's stomach, into which it is possible to peer, so that we have here a new domain open to psychological science, which, when it is understood, will be found to be a very essential factor in the mediumistic diathesis.

Psychic researchers to-day represent the last potent stand of about all the old superstitions of the past, against which science has contended. The next generation will be hardly able to believe that prominent men in this wasted their energies in chasing such a will-of-the-wisp as the veracity of messages or the reality of a post-mortem existence, which they no more prove than dreams of levitation prove that man can hover in the air at will. It is the diathesis of mediumship to over-work the projection mechanism, and put forth its reveries as if they were revelations, and really had been valuable instead of being simply and solely subjective. This girl regards any impression that springs up as a result of mediate association in her mind as objectively true, and yet nothing is so plain as that she plays both rôles of listening to her own oracle, inebriated by her own elixir vitae. She was able to feel that my fictitious niece, S. B., was betraying her, so that there was a strange combination of girlish naïveté and an almost incredible subtlety and artifice. S. B. laid bare many of these mazes in a way twice pathetic, first because

of the narratives themselves which if true, (as later investigation seemed to indicate, many, if not most, of them were) were bad enough and must have caused very great pain when they happened and would be distressing to remember; and second, because of the pain now of having all these repeated to outsiders. Over and over we are reminded by S. B. that nothing of all she has told is said by the medium herself, but it is the control who knows and betrays, because believing it to be for her good. So intent is S. B. upon this exposure, that she cannot be brought to leave any word for her mother, or give me or any other mundane thing much attention. This phantom niece was most intent upon gentle overtures to overcome obstacles, to allay suspicions, and this was why she had come so far and was so oblivious of her quondam friends, now that she was here, from out of the vast depths of space. Perhaps we had summoned the spirit of some real person who had lived under the name we chose, and she was not voluble with reminiscences because out of her sphere of acquaintances. We thought S. B. was not even a shade, but only a verbal shadow of a shade, and perhaps her silence ought to be interpreted as conviction of our fraud. The medium set the scene, brought out and hung up the wardrobe on our dummy, but no personality came to put it on or to really interpret the rôle.

But if this be so, how could our lay figure be so informed concerning our medium, who knew no such person; and why should she be so intent upon her errand of mercy? Can even a lying thought in a mortal brain or mind create a new individual soul out of nothing, as Mrs. Eddy thought mortal mind creates and destroys all diseases, fear, death, etc.? Perhaps false thoughts may originate personality or make a nomen into a numen, entifying empty sounds. Man has done this with countless mythological persons, some of whom have been canonized as saints. Thus perhaps my niece, at first a mere name, warmed into life, as the marble Galatea, when she stepped down from her pedestal a human being. Perhaps some real soul (since all of them want to get back to life), assumed a rôle of the name we gave, and since there was no Sarah Beals some accommodating spirit stepped forward to take her place. If this is the case and some subtle spirit pressed into my own skeptical sphere of thought, under the guise of a lie, because there was no other way, it would seem that the fact that I was willing to imagine a spirit gave him his opportunity, or in other words, made my defensive armor vulnerable at this point, so strong was the passion of

this disembodied soul to make contact with this world and to justify her *raison d'être* here by an act of mercy. Thus our clumsy strategy was made an open door of opportunity to succor a maiden in distress, and perhaps thus the spirits used our frailties to accomplish their own ends and overrule our purposes, ordaining help and truth out of our falsehood as God is said to make the wrath of man to praise him.

Very soon after the last session, Freud and Jung spent a week at my house, while lecturing at the University. I mentioned the case and they expressed a desire to see the girl, and she obligingly came in; in a short interview with her they at once diagnosed the true nature of it all, and to my surprise she frankly confessed that her chief motive from the first had been to win the love of her adored one, and said that if he would take her as his pupil, all she wished for might thus be accomplished without the aid of spirits, although even this, it appeared, he had refused to do. The audience with a group of psychic researchers she had succeeded in arranging "in half an hour," while we had not been able to gather scientists "in weeks and months," had entirely failed to help her toward her goal. The erotic motivation was obvious and the German savants saw little further to interest them in the case, and I was a trifle mortified that now the purpose so long hidden from us was so conscious and so openly confessed. They suspected a possible incipient dementia praecox, which we were a little loath to accept, because we had urged upon her that it was better to be her own richly endowed personality than to be the mouthpiece of a dozen magnates of the spirit world.

Some weeks later, the girl called for the last time and said very briefly, in substance, that she had fallen in love with another and very different kind of man, and that neither he nor she cared to have anything more to do with spiritism, adding that she had come to believe in it no more than we did, that she had always accepted it with reservations, and was now very happy. Since then (1909) we have seen or been able to hear nothing of her. This seemed perhaps a happy issue.

There is in all the wide domain of psychology perhaps no such *terra incognita* as the heart of the adolescent girl. I have collected a few data on the subject ("Educational Problems," Chapter VI, which outlines perhaps a score of cases illustrating the very prominent rôle such girls have played in the history of spiritistic phenomena from the Fox sisters on; see also Chapter X, on "The Budding Girl," and

Kohl's "Sexualität und Pubertät," which epitomizes many German works touching this subject).

Hers was a divided soul. She listened to the spirits and yet doubted them and never entirely surrendered herself to their control but scrutinized carefully all they said. The only affectation of ignorance on her part of their utterances was of the painful things S. B. had said about her and her relatives, and yet her flushing, tremors of voice and very evident embarrassment showed that she had heard and understood, reacting to it all as any normal girl might have done to such narratives so closely touching her home, her relatives, and herself. She doubted and had renounced belief in the love of her idol, but her chief control, "Zezy," had pertinaciously insisted that he loved her and wanted all along only the clearance of her name and opportunity to urge his suit. There was abundant evidence, too, that between sessions she had practised at home with the spirit personalities we suggested to her, and had evolved some very clear imagery as to what they were like and also had more or less developed them into individual rôles and had images of certain incidents with such Cartesian clearness and distinctness that they seemed to her to be certain, *e. g.*, the description of her father's childhood home, certain of Mr. Clark's pictures, my smearing my brother's face with jam, a high cliff with a fence around it, a tree with four roots, etc. These spontaneities were confidently recited in an almost challenging way, as if their truth were unquestionable, and the only point was whether we could or could not remember them. Very different were the new spontaneities or the suggestions that came from us for the first time at a seance. Over these she always hesitated, accepted them tentatively, while they were indefinite, and were very easily transformed, sometimes into their very opposites, at the slightest hint from us.

Perhaps all the light shed by this case is darkness. The adult, painstaking, male mind may be hopelessly incompetent to understand the effervescence of the ephebic girl, for he has very often been at her mercy. Perhaps in all girls at this stage of life there is a period of hysterical longing to be the center of attention that stops at nothing to fool wiseacres to the top of their bent, as Luys' favorite patient did him. Perhaps our subject never believed in spirits but cultivated them for years as a lark, or a kind of experiment, and then later used them more seriously as means to an erotic goal. Perhaps her final avowal of another love and of the abandonment of all concerning ghosts was a ruse or a fiction to bring to a definite

close her romance with us, while she may have held to it throughout. The second lover was perhaps little more than an imaginary companion introduced to close the incidents with us, and he may have been as unreal as the spirits themselves. Or finally, it is just possible that some credence in imaginary converse with the great departed we read of in history, or with angelic or planetary souls, may be a mode of developing the soul of the adolescent girl by giving vent to her struggling, very diverse, and too often mutually suppressed impulses, and that this helps on to a fuller and a more rounded development. Possibly, too, this cult may sometime suggest a new method of investigating this tendron or *Backfisch* but mysterious land of fancy.

A PSYCHO-ANALYTIC STUDY OF AUGUSTE COMTE

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Escaping from the narrow field to which they were first limited, the psycho-analytic theories have come to have an universal application, for they have built up a causal relation in human conduct. In addition to the old descriptive psychology, we have now what Crile in his *Origin and Nature of the Emotions* has defined as a "science of man's activities as determined by the environmental stimuli of his phylogeny and his ontogeny." (2:p. 154.) The repressions, the complexes, the symbolisms which Freud and his followers have found in their analyses of hysterical and insane patients, are present in the mental life of every human being. There are only two distinctions between the normal and abnormal mind,—first, the intensity and number of the repressions and complexes; second the methods by which this psycho-physical energy finds an outlet. The madman and the genius are activated by the same motives, but the insane man escapes from the painful realities of his life by means of his delusions, while the poet who has been unhappy in love finds consolation in the writing of exquisite love lyrics.

Freud, Jones, Pfister, and others have given us searching analyses of men whose names stand high in the worlds of literature, art, music, statesmanship and mysticism; Segantini, Da Vinci, Andrea del Sarto, Dante, Lenau, von Kleist, Wagner, Bonaparte, von Zinzendorf, etc. (6.) The field of Philosophy alone has remained almost untouched. Von Winterstein, to be sure, has said that the philosopher is actuated by two fundamental motives: first, the eternal mother-longing, which is manifested in the desire to find some ultimate principle, some lasting reality, as an anchor in the constant flux of life; and second, the narcissistic impulse which leads the philosopher to make himself, and incidentally all mankind, one with the universe and with God. (19.) Yet while these two motives may apply generally, they are insufficient to explain individual philosophies. Hitschmann, in his masterly analysis of Schopenhauer, has shown that the whole pessimistic philosophy of the latter was determined by his childhood, and that the transformation of his mother

complex into its ambi-valent form of hatred was responsible for his attitude toward all women and toward society in general. (10.) Moreover, it is not narcissism, in the strictest sense of the term, but rather the will to power which is the basis of much philosophical identification with God. Nietzsche, as Jung has pointed out in his *Psychologie der unbewussten Prozesse*, is the quintessence of this power type, since he goes so far as to make man himself the supreme overlord and to dispense with God entirely. (11: pp. 44-48.)

Auguste Comte, French philosopher and founder of the science of sociology, is no less interesting a figure for study in the light of psychoanalytic interpretation than are Schopenhauer and Nietzsche. The unique quality of a mind which could construct the Positive Philosophy, and found a new science of society, yet which could later propose a cult or religion which, though profoundly truthful in its conception, was arranged in a form utterly fantastic and absurd, has long puzzled the psychologist and the student of philosophy. Many explanations of Comte's change of character have been suggested, but there have remained unnoted or misinterpreted certain forces in his life which afford a more rational explanation than any yet advanced. It is these more fundamental causes which this paper attempts to point out.

Auguste Comte was born at Montpellier, France, January 19, 1798. His family was in moderate circumstances, his father being a receiver-general of taxes. His mother, Mme. Rosalie Boyer, is characterized by Robinet as "a woman of great heart and noble character." (16: p. 115.) Like her husband, she was a devout Catholic and a staunch Royalist; but at the age of fourteen Comte had repudiated all sympathy with either belief. Instead of growing up with his brother and sister under the gentle influence of his mother, Comte was placed in the public school of Montpellier, where, though scarcely nine years old at his entrance, he made rapid progress, and was soon recognized as one of the brightest pupils. So great was his ardor for study that in three years he had completed the whole course in literature. At the age of twelve, then, he began his study of mathematics, in which branch he became so proficient that at sixteen he passed the examinations for the *École Polytechnique*, receiving one of the first places, although he was still a year below the age required for entrance. Meanwhile, one of his old masters at the Montpellier school had become ill, so Comte employed his enforced year of waiting in giving a course of mathematics there.

In 1814, Comte entered the *École Polytechnique* at Paris. Although only seventeen, and handicapped by an immature and sickly appearance, he soon showed that he possessed a mature and thoughtful mind. Brilliantly successful in his mathematical studies, he yet had much leisure time, which he devoted to the study of philosophy, the history of the French revolution and other political studies. Thus there was roused in him the first feeling of the necessity for social reconstruction and political reformation.

By comrades and teachers alike, Comte was considered an exceptional character, of superior mental ability and unusual decisiveness. But the old spirit of insubordination which he had shown even in his early school days at Montpellier, was still strong within him. His rebellious career at the *École Polytechnique* ended in 1816, when he became ringleader of an insurrection which broke up the school and caused him to be sent home under the surveillance of the police. The police supervision was neither very strict nor very long continued, but his notorious dismissal from the *École Polytechnique* proved to be a serious obstacle to the continuation of his career. However, he soon returned to Paris, where he managed to earn a living by becoming a private teacher of mathematics, and resumed his studies. He took up especially cosmology, biology and history, thus building up in his own mind the scientific hierarchy which he afterward formulated in his *Positive Philosophy*.

In 1818, Comte met Saint-Simon, with whom for the next six years he was to be associated as secretary, collaborator and pupil. Saint-Simon's teachings were founded on two ideals which he had only vaguely formulated: first, to establish a demonstrable faith by replacing theology with science; second, to make the proletariat a part of society by replacing war with industry. He had not, however, the intellect to take the first step toward realizing these ideals; and it remained for his more brilliant pupil to systematize and reduce to some logical form these disjointed concepts. But as Saint-Simon grew to turn more and more to theology and metaphysics, the friendship between the two men became cooler, until finally, in 1824, Comte broke off all relations with his teacher.

On February 29, 1825, despite the protests of his family and friends, Comte married Mme. Carolin Massin, with whom for some time he had been having relations in her capacity as "fille publique." Their whole married life, until their final separation in 1842, was a series of misunderstandings and a

constant source of unhappiness. Comte was an intolerable domestic tyrant, absorbed in himself and his work. His wife had no patience with his disregard of material success and prosperity, and relieved the tedium of her domestic life by frequent liaisons with other men. Altogether, Comte's personal experience was far indeed from the ideal marital relation of his writings and of his social philosophy.

In 1826, Comte began a series of lectures setting forth his Positive Philosophy, but after the first three had been given, this work was interrupted by the first of the three "mental crises" which have been so variously utilized in explaining the peculiarities of his life and work. This first cerebral attack was prolonged and severe. It led him to suicidal attempts, and necessitated his confinement in an institution where he could receive proper care and attention. By 1828, however, he had fully recovered, and was able to resume his course of lectures, and to begin his *Cours de Philosophie Positive*, the first volume of which was published in 1830, the sixth and last in 1842.

In 1832, Comte became first, lecturer at the *École Polytechnique*, and then one of the examiners. Four years later, he was given the principal chair of mathematics in that institution. But his period of prosperity and recognition was short, for the publication of his Positive Philosophy, in which he had made sociology highest of the sciences, brought him once more into disfavor, and caused his second dismissal from the school. Condemned by the theologians, abandoned by the scientists, misunderstood by the Revolutionists, unknown to the mass of people, cut off from his family and deserted by his wife, Comte lived a life of complete isolation until in 1845 he met the woman who was to play so vital a part in his after life,—Mme. Clotilde de Vaux. Her physical charm and loveliness as well as the grace and intelligence of her mind, combined to make Comte love and revere her. Both were bound legally to mates whom they would never see again, but morally both were free. An equal isolation, an equal need of affection, drew them together, but an ideal of marriage unique in the purity and idealism of its conception, never permitted them the fullest expression of their affection. Throughout the short year of their companionship, until Mme. de Vaux's death in 1846, their love was always platonic, their comradeship ever on the spiritual plane. Yet it is to Mme. de Vaux's softening influence that Comte attributes his abandonment of the strictly intellectual and scientific position which he had maintained in his Positive Philosophy

for the evaluation of the emotions and the affective life which he expresses in his Positive Polity. This is the work which he terms an expression of his second career, and which was completed during the years from 1851 to 1854. Meanwhile, in 1849, he had published the Positivist Calendar, and in 1852, the Catechism of Positivism. He died in 1857, the cause of his death being a cancerous growth in the stomach.

In order to understand the marked contrast between Comte's mental attitude during his early years and that of his later life, we must keep in mind Jung's hypothesis of the two psychological types, the introvert and extrovert,—the thinking type and the feeling type. (11:pp. 9-94.) Two motives, says Jung, have previously been advanced as the basis of all human conduct. The first of these, the sexual theory, was advanced by Freud, and assumes that the great complex of instincts and emotions which center around the reproductive functions is the guiding principle of existence, that there is no joy in life equal to the joy of feeling in oneself the creative power, whether it be expressed in its original biological form or on the higher plane of productive labor. Our modern civilization has imposed upon the human race an unreasonable control of these natural tendencies, not only through economic pressure but by means of new social and moral standards. Herein lies the whole root of mental conflict, for man's primitive passions are constantly rising against the moral ideals which he attempts to impose upon himself. The erotic desires of the subconscious are incompatible with conscious morality, and hence grows the neurosis, which is inseparable from the sexual problem of our age. The neurotic is merely trying to solve the universal problem in his own personality.

The other theory of human conduct is the Adlerian postulate of the *Ichtrieb* or *Wille zur Macht*. In this statement, the instincts which lead to the preservation of the species are subordinated to the impulses which lead to the fullest development of the individual, even at the cost of racial welfare. The psychic expression of this motive is an inordinate craving for superiority and a desire to be and to do all things; but since this lust for power can never be fully satisfied, it, too, becomes the basis of the neurotic conflict.

The contradictory viewpoint of these two theories is explained, according to Jung, by the fact that both are the product of a one-sided psychology. The truth is that both principles are present in every mind. The human soul, sick or well, can never be explained by one motive alone; it is neither wholly racial nor wholly individualistic, but what these

two have made it and will make it. It is necessary, therefore, to build up a new hypothesis which shall rest on a broader foundation than either of these theories, and which shall include both of them, hence his idea of the two psychological types,—the introvert or Adlerian type, and the extrovert, or Freudian type.

"Each of the two has one function especially well developed; the introverted type uses thought as an adaptive function and thinks of its conduct in advance, while the extroverted type feels itself into an object while it acts. . . . The neurotic conflict always occurs between the adapted function and the non-differentiated and for the most part unconscious, companion function. That is, in the introverts, between thought and unconscious feeling, and in the extroverts between feeling and unconscious thought. When in the thinking man there comes a demand which he cannot master alone by thought and without differentiated feeling, then a pathogenic or traumatic conflict arises; and conversely, with the feeling man, when he faces the problem that demands differentiated thought, then comes his moment of crisis." (11: pp. 73 and 77)

These two psychological types have long been recognized, but Jung is the first to seize upon their real significance. William White, in "The Mechanisms of Character Formation," describes the extroverts as characterized by rapid reaction, prompt production, and an abundance of ideas and projects. They are admirable teachers, having a contagious enthusiasm and exercising great personal influence on their pupils. The introverts, on the other hand, are of slow reaction, produce with much effort, live removed and shut up in themselves, and give their life to the achievement of a perfect work which often secures them a posthumous celebrity, (21 p. 217-221), William James, Müller-Freienfels, and other psychologists have described similar types, differing only in applying to them other terms than introvert and extrovert.

Although every person has a slight leaning toward one type or the other, it is obvious that both impulses must exist in everyone. The passing on of the torch of life demands that the individual have both the egoistic instincts which lead to self-preservation and which are strongest in the introvert, and the broader impulses of the extrovert which lead to racial preservation.

"Civilized man," says Jung, in *Die Psychologie der Unbewussten Prozesse*, "leans a little more toward one motive than the other. For the fullest expression of life, a balanced interplay of both tendencies is necessary; together they form a complete personality." (11:p. 75.)

The two tendencies are, in fact, in a sense ambi-valent; the

individual is constantly oscillating between them according to the necessities of his environment. As will be seen later, it is in this ambivalent quality of introversion and extroversion that we find an explanation of Auguste Comte's peculiar mental reactions.

One other general concept is necessary for the proper understanding of Comte's character before we consider in detail the interacting forces which shaped his destiny,—the idea of religion as a necessary psychic function. Here, again, it is Jung who has recognized the vital significance of a fact which has been variously stated by other thinkers. Below the subconscious of Adler and Freud, which is the realm of childhood experiences, and desires, whether of infantile sexuality or infantile will for power, lie the deeper levels of the psyche which contain our phyletic memories and experiences, and which must also have their proper outlet. The chief means by which this "absolute subconscious" finds expression is through religion, which is nothing more nor less than a projection of man's own deepest emotions.

It was this projection of personality which Durkheim unwittingly described as the basic principle in totemism,—the idea of a mysterious, impersonal power, an all-pervading force, which the Australians call "Arunkulta," the Melanesians, "Mana," and the Iroquois Indians, "Orenda." (20.) Carpenter, too, in *The Gods as Embodiments of Race Memory*, has given us a beautiful exposition of this viewpoint, in which he does justice to Spenser's ghost theory of religion, and also shows the deeper underlying forces emphasized by Jung:

"Current explanations of the gods—as from generalisations of nature-phenomena, or idealisations of heroic men and women, modified by traditions, memories and dreams, and complicated by mistakes in the meanings of words and names,—are certainly suggestive; but while they help us to understand the origin of the forms of the gods, they fail almost entirely to account for their astounding power and influence, or to explain why to the savage and untutored mind mere generalisations and abstractions should have acquired such intense reality. Such gods must represent some real force influencing mankind. The figures of the gods are apparitions or manifestations of the conscious life of the race in the mind of the individual. . . . How many times in past ages has the sun broken upon our primitive ancestors, bringing relief after the darkness and terrors of the night, and giving a sense of joy and comfort. How continually has this sense grown, with reverberant intensity, in the successive generations, till at last in some more than usually subtle and sensitive soul, it has broken into a strange consciousness of a presence,—the presence, in fact, within that soul, of the myriad life and emotion of those that have gone before. There is a personification, not because we are

really coming into touch with the sun or moon, but with the great subconscious mind of the race. . . . 'The god or goddess is but the composite of numberless race memories, a beautiful, luminous ghost made of centillions of memories.' Throughout the ages, man has sought woman, woman man, and in the very nerve plexuses of every youth and maid there is imbedded a composite sex ideal bequeathed by heredity and formed by superimposing various figures upon each other. So, too, the battles of the race have stamped within us the picture of the hero. These composite memories dwell in our very nerve centers of love, pugnacity, sympathy, etc., just as the Gods dwell in their temples, and when some object of our environment rouses these sleeping recollections, we feel the presence of the gods. . . . The figure of Christ is not merely the ideal of humanity which we should strive to emulate, he is also the memory of all the suffering, all the love, all the pain we have borne in our phyletic development. . . . The life and memory of the human race, the vast accumulation of experience in the slowly evolved nervous organization of mankind, form the Olympus whereon the Gods dwell. Each unit mind is an offshoot of the racial mind; each unit body is an offshoot of the racial body; and as far as, for each individual, his mind and body register the memory of the race, they form the gate of entry into this other world." (3: pp. 259-279).

This racial memory of Carpenter's is synonymous with the absolute subconscious of Jung, and both authors have recognized that it plays a vital part in our religious life. The poets, moreover, whose sympathetic and sensitive natures often permit them to grasp in one intuitive flash the underlying principles which the scientist is laboring to explain, have long since recognized that religion is but a projection of the human soul.

"*Deus est in pectore nostro*," wrote Ovid; while in the *Rubaiyat of Omar Khayyam* we find the following significant lines:

"I sent my Soul through the Invisible,
Some letter of that After-life to spell:
And by and by my Soul return'd to me,
And answered, 'I myself am Heaven and Hell.'"

"Heaven but the Vision of fulfill'd Desire,
And Hell the Shadow from a Soul on fire,
Cast on the Darkness into which Ourselves
So late emerged from, shall so soon expire."

It is not strange, however, even with the aid of the poets, that it has not been generally recognized that our gods and demons are but the reflections of our own virtues and vices, since the distinction between the self and not-self is at best developed at a relatively late period in the life of the race and of the individual. Students of primitive mankind have found our ancestors firm in the belief that their shadows and

reflections were a part of themselves, and that their dreams were real experiences. G. Stanley Hall in *Some Early Aspects of the Sense of Self*, has shown that children commonly fail to connect various parts of their bodies with their own personalities. (8.) It is no wonder, then, that we have not realized that our deities become real to us only as they are extensions of our own mental processes.

At this point, the bearing of Jung's statement that religion is a necessary function of the human psyche becomes clear. According to him, it is dangerous to lose faith in the old Gods, unless we can substitute some more rational form of religion as an outlet for those deeper emotions which lie within the lowest levels of the human mind, the absolute subconscious. Only as we replace our old superstitions with higher and better ideals to which we can give our passionate devotion can we retain a sane and normal attitude toward ourselves and toward life. There have been formulated for this purpose, two kinds of religion: first, the religion of humanity, which allows us to lavish all our love and tender emotions upon our fellow-beings; and second, the cosmic emotion which G. Stanley Hall has summarized as follows:

"God is simply the personification of the cosmic order, and religion is loyalty to it . . . 'Our Father' is merely an expression of my filial relation to the great one and all from which my own being was derived through the long processes of evolution. I am a son of the sky and the nebulae; thence I came and into them I shall be resolved. . . . This conception makes us realize that we are relatives not only of plant and animal life, but of rocks, soil, sea, air; brothers of every element; that all are our kin, for we have the same parent,—the primordial basis out of which the world arose. . . . It is this sanifying sense of being truly at home in the cosmos on which all religions rest." (9: pp. 139-140.)

Why Comte should choose the humanitarian religion instead of the cosmic interpretation which seems so eminently adapted to his type of mind, is one of the questions which this paper attempts to answer.

In the light of Jung's theory of the two opposing psychic tendencies of thought and feeling, Comte's history becomes significant. For the greater part of his life, he was pre-eminently the introvert type, reacting intellectually rather than emotionally to most situations, and actuated always by the egoistic lust for power. Even in childhood, he had developed that tendency to immure himself in scholastic

seclusion which became so prominent a part of his later development, while his rebellious student days were but the expression of the desire to show himself superior to all about him, even the wisest of his teachers, whom even at ten he criticised severely. At the age of twenty, he writes that in emulation of Benjamin Franklin, for whom he had a great admiration, he has "formulated the design to become perfectly wise," but adds that he has dared to conceive this ideal much earlier in life than did his idol. This naïve addition to his assertion shows once more his determination never to permit himself any feeling of inferiority to others in the realm of intellectual life. Herein, Comte furnishes us with a beautiful illustration of the Adlerian principle of compensation. (1:pp. 1-34.) Robinet, his most sympathetic biographer, has pictured him as the typical example of the neurotic constitution, physically undeveloped, and disturbed by continued ailments of the alimentary organs. (16:pp. 307-315.) For this organic inferiority, he compensated by a continual striving for intellectual superiority, sacrificing to his intellect all the natural play of youth, all the emotional tang which makes life a vivid and joyous reality. This struggle for a feeling of psychic power continued during the more mature years of his life. It was manifested in his refusals to admit that his once beloved teacher, Saint-Simon, had made any faint contribution to the Positive Philosophy, and it appeared in his intolerant attitude toward his wife. Schoff, in "A Neglected Chapter in the Life of Comte," tells us that he went so far as to sign himself Brutus Bonaparte in his marriage ceremony, and that he compared himself with St. Paul and Aristotle. (17.) Finally, his extrovertive tendencies found complete expression in the work which has made his name famous—the Positive Philosophy—and which may be briefly outlined as follows (12):

Each branch of our knowledge passes successively through three different theoretical stages:

1. The theological or fictitious.
2. The metaphysical or abstract.
3. The scientific or positive.

The first is the necessary point of departure of the human understanding, and the third is its fixed or definitive stage. The second is merely a state of transition. In the theological state, the human mind, seeking the essential nature of beings, the first and final causes, the origin and purpose of all things,—in short, absolute knowledge,—supposes all phenomena to be produced by the immediate action of supernatural beings. In the metaphysical state, which is only a modification of the first, the mind supposes, instead of supernatural beings, abstract forces, veritable entities, personified abstractions,

inherent in all beings, and capable of producing all phenomena. In the final, the positive state, the mind has given over the vain search for Absolute notions, the origin and destination of the universe, and the causes of phenomena, and applies itself to the study of their laws,—that is, their invariable relations of succession and resemblances. Reasoning and observation, duly combined, are the means to this knowledge. What is now understood when we speak of an explanation of facts is simply the establishment of a connection between single phenomena and some general facts.

There is no science which, having attained the positive stage, does not bear marks of having passed through the others. Some time since it was composed of metaphysical abstractions; and farther back, it took its form from theological conceptions. The different branches of our knowledge have passed through the three stages of progress at different rates, and have not therefore arrived at the same stage simultaneously.

The Positive Philosophy possesses four distinct advantages over other methods. First, the study of the Positive Philosophy affords the only rational means of exhibiting the logical laws of the human mind which have hitherto been sought by unsuitable methods. The second effect will be a regeneration of education. In the third place, it will advance the sciences by combining them. Last of all, the Positive Philosophy offers the only sound basis for that social reorganisation which must succeed the critical condition in which the most civilized nations are now living.

The principle on which we may base our classification of the sciences is found by comparison. All observable phenomena may be included within a very few categories, or sciences, so arranged that the study of each category may be grounded on the principal laws of the preceding, and serve as the basis of the next ensuing. The order of arrangement is determined by the degree of simplicity or generality of the phenomena included in each category. We must begin with the study of the most general or simple phenomena, going on to the more particular or complex, for this order fixes the degree of facility in the study of these phenomena, and is the logical connection of the sciences as determined by their successive dependence on each other. The order which results is this: Mathematics, Astronomy, Physics, Chemistry, Physiology and Social Physics or Sociology.

Mathematics has for its object the indirect measurement of magnitudes, and it proposes to determine magnitudes by each other, according to the prime relations which exist between them. The spirit of mathematics, therefore, consists in regarding as mutually connected all the qualities which can be presented by any phenomenon whatsoever. Evidently, all phenomena may be regarded as affording such considerations, and hence results the indefinite extent, the universality and simplicity of its phenomena, which places mathematics first in the hierarchy of sciences. The three branches of the mathematical science are calculus, geometry and rational mechanics. Calculus, which consists of arithmetic and algebra, deals with the most simple and general phenomena, and the truths which it formulates holds for all things. Geometry presupposes a knowledge of calculus, while rational mechanics depends on both the others.

Astronomy logically follows mathematics, for its truths rest on arithmetical, geometrical and mechanical laws upon which it exercises no influence, but to which it adds a group of new facts. Physics depends not only on the mathematical sciences, but also on astronomy,

for terrestrial phenomena are influenced by the motion of the earth and of celestial bodies. It consists of a study of the laws which regulate the general properties of bodies, always placed in circumstances which admit of their molecules remaining unaltered. Chemistry studies the modifications that all substances may undergo in virtue of their molecular reactions, and is thus a step in advance of physics. Biology, which consists of anatomy and physiology, gives its attention to the structure and activities of an organism, calling into use when necessary the truths established by physics and chemistry. Its peculiar office is the experimental and rational study of the phenomena of interior sensibility peculiar to the cerebral ganglions.

The social science is still confused by the theological and metaphysical points of view, so that our first task is to apply the positive methods here as in the other sciences, and ascertain the chief bases on which it is founded. The first division of this category is social statics, which inquires into the conditions which constitute social equilibrium and insure the permanence of social states. The individual life, ruled by personal instincts, prepares for personal morality; the domestic life, governed by the sympathetic instincts, subordinates the selfish tendencies to sympathy; while the social life has for its guides the development of the intellect and enlightened reason. Social dynamics considers society as a series of stages, each resulting from the preceding and leading on to the next by imperceptible gradations. Broadly speaking, this progress has been from the militaristic phase through the juristic phase to the industrial phase,—three stages of social development which correspond to the theological, metaphysical and positive stages of scientific progress. The positive viewpoint will modify human existence by a reconstruction of the scientific, political, moral and esthetic life, for all activities will be based on clear knowledge of what has gone before and an increasing prevision of results.

In all probability, we could obtain no better idea of Comte's nature during the first part of his life than by this glimpse of the contents of his consciousness as revealed in his Positive Philosophy. His is indeed the extreme introvertive reaction; he has cast aside forever theology and metaphysics, and has set up the intellect as the supreme good of existence. The emotions, too, in so far as is possible, must be gotten rid of, for they are a detriment to clear thinking. He bars psychology from his hierarchy of sciences because we can neither reason about those organs with which we do our reasoning, nor observe them, while the emotions so confuse our faculties that we can come to no valuable conclusion concerning them.

But one of the queerest turns taken by Comte's tendency to introversion appeared in his system of "cerebral hygiene." Long before the completion of his first great treatise, he had adopted the rule to abstain from the reading of all newspapers, periodicals, scientific publications, and indeed of all literature except the works of Dante and one or two other favorite poets, lest he be distracted by worthless ideas. John

Stuart Mill characterizes the outcome of this mental hygiene as "a gigantic self-confidence, not to say self-conceit," and adds that "as his thoughts grew more extravagant, his self-confidence grew more outrageous." (13:pp. 127-130.) In reality, not only was Comte's egoism strengthened by this procedure, to which it had in the first place given rise, but his "cerebral hygiene" itself was result as well as cause of his colossal self-esteem.

Comte's introverted tendencies served his purpose very well for nearly thirty years, but he could not hope to escape forever the penalty which he was doomed to pay for having so long suppressed his affective life, both personal and absolute. It is not surprising that the next fifteen years of his life were a period of conflict between these two psychic forces, in which his repressed emotions struggled to find some outlet, causing the mental crises which so puzzled his followers. Until his marriage with Carolin Massin, Comte had met every situation with thought, but this was a condition which necessitated an emotional reaction, so he promptly developed the psychoneurosis which Jung asserts to be the only refuge of the introvert in such a crisis.

As we shall see later, Comte had a well developed mother complex. Perhaps this was reinforced by the fact that he had been under the maternal care only eight years, so that the mother of his childhood memories was the mother of that early period of the child's existence when she is for him all that is tender and loving, before she has had time to become identified with any of the thwarting factors of his environment. There could be no greater contrast to such a maternal type than Comte's wife. His mother had been a delicate, refined gentlewoman, sheltered in her holy Catholic faith. Carolin Massin was a hustling, energetic, business woman, who possessed an intimate knowledge of men and of life in all its varied phases. Comte had found her quite capable of satisfying his physical desires, but when he attempted to realize in her his ideal of the wife and mother, his whole subconscious soul rose in revolt, and he slipped into the neurosis previously mentioned.

Other factors doubtless contributed to bring about his first nervous breakdown. There can be little doubt that it tended toward the manic-depressive type, for it was expressed in fits of mania alternating with suicidal impulses. Moreover, Comte's physical weaknesses were of the kind that are characteristic of manic-depressive insanity, for he suffered constantly from disturbances of the alimentary tract. It is

significant, by the way, in connection with our definition of religion as a necessary psychic function, that during the two years of his mental aberration, Comte slipped back from his Positivist beliefs into the theological state of his early youth. In the final analysis, however, we cannot but conclude that the unconscious motive of this psychosis was an attempt to force his wife to conform to the maternal ideal which governed his affective life, for its onset followed her desertion of him for another man, and his recovery was promoted by her return and faithful care.

Comte's second mental crisis in 1838, though very slight, confirms this viewpoint, for it, too, coincided with threats of desertion by his wife, and was allayed by her postponement of her decision. That it was due to an outbreak of repressed extrovertive tendencies, is shown by Comte's own discussion of it:

"Its principal marked result consisted in a vivid and permanent stimulation of my taste for the different fine arts, especially poetry and music, which then received a considerable increase. You feel immediately the spontaneous affinity with my later tendency towards a life principally affective; and further, it very happily improved my work in all relating to the esthetic evolution of humanity." (15.)

Finally, in 1845, came the great emotional crisis of Comte's life, when, under the influence of his love for Clotilde de Vaux, the affective element assumed gigantic proportions, and his introvertive tendencies swung over wholly and irrevocably to the ambi-valent impulses of extroversion. No better proofs of the remarkable influence which Clotilde exercised upon his destiny can be found than in a comparison of his second great work, the "*Système de Politique Positive*," with his first treatise on Positive Philosophy. There could be no more striking evidence of the radical change in Comte's nature than his reiteration, in this second work, of the fundamental necessity of the affective life and of religion, and his utter repudiation of his former coldly scientific viewpoint.

The Positive Polity is dedicated in the most fervent terms, "To the sacred memory of my eternal friend, Mme. Clotilde de Vaux," and this dedication is ended with a quotation from Dante, which applies to Clotilde the impassioned and reverent apostrophe which the poet addressed to Beatrice. The appendix to the first volume contains Mme. de Vaux's novelette, *Lucie*, which is nothing more nor less than a picture of her own life, little to be recommended from a literary viewpoint, though Comte classed it with the works of George Sand. It

also contains her poem, *Thoughts of a Flower*, which Comte valued so highly and rated so absurdly.

The Positive Polity proper is published in four volumes, and its scope may be stated as follows. (5.)

Volume I is entitled *A General View of Positivism*, and is a summary of Comte's Positive Philosophy and religion of humanity, and a statement of his plan of social reconstruction of which Love is the principle, Order the basis, and Progress the end. The Positivism of this writing is, however, a different Positivism from that explained in his earlier works, for it recognizes that the intellect must ever be subordinated to the affective life. The new Positivism means a control of the selfish affections and a strengthening of the unselfish motives. While it makes the emotions the highest force in life, it will satisfy the reason by making Sociology still the supreme science and humanity our God. It will make use of its knowledge of the laws of social relativity to aid human progress, and it will set up a priesthood to teach the subordination of selfish love to social love.

This is a most auspicious time to introduce Positivism, for the French Revolution has stimulated the desire for progress and hence will lead to a study of social phenomena. Under the influence of the Revolution too, a sense of human development and the social feelings has arisen in the minds of people on the lower classes, not only in France but in all Western Europe. The great problem of reconstruction is the subordination of politics to morals, and it will be worked out in a republic composed of Italy, Spain, England and Germany grouped around France as the center.

Spiritual organization is the only point where an immediate beginning can be made, and when this has progressed sufficiently it will regenerate political institutions. We must have a priesthood to educate the social emotions which are the basis of morality.

The domestic relations form the bridge between selfish love and universal benevolence. Woman as wife and mother has a great mission, for the worship of woman is a preparation for the worship of humanity. The Positivism which is based only on science and the intellect is incomplete. Complete Positivism gives play to the emotions in poetry, art and religion. The religion of humanity is the rational culmination of Positivism, the great conception toward which every aspect of that philosophy converges. We must therefore institute a calendar in commemoration of those who have served Humanity, and hold festivals in worship of this Great Being.

Science and art cooperate in the service of this religion. The history of universal Love, the soul by which the Great Being Humanity is animated, is in itself an endless theme for the poetry of the future, while artists can devote their noblest works to a representation of the emblem of the Great Being, a woman of thirty with her son in her arms. The sciences all lead to the supreme science of Sociology, and hence can be used in the service of Humanity.

Here, only, does Comte digress from his theme of love and religion long enough to give a brief review of his hierarchy of sciences as elaborated in his *Cours de Philosophie Positive*.

The second volume of Positive Polity is called *Social Statics*. It, too, stresses the necessity of religion in words which seem to be drawn from Comte's own experience, for he declares that no mere scientific knowledge can bring to us inner harmony, but that unity of man within can arise only by submission to an Order without; that we

must find an emotional outlet in a Being like but superior to man. This introduction is followed by an historical sketch of religion, a survey of the family and other social institutions, and by a revised hierarchy of sciences in which there is placed above the science of Sociology a new science of Morals, which it is the duty of the priesthood to teach.

In the interval between the publication of this volume and the following one, Comte wrote *The Catechism of the Positive Religion*, a popular exposition of the religion of humanity which he was treating more adequately in his *Positive Polity*, and which contained, among other data, his *Positivist Calendar* with its months and days consecrated to the memory of those who had benefited humanity by their lives and deeds. The name of Clotilde de Vaux was prominent among the saints listed on this calendar.

Volume III, *Social Dynamics*, is an account of man's evolution from a less religious to a more religious state. The human mind has had three chief stages of development. The first of these is the physical, which is more general but less complex and less noble than the other two. The second is the intellectual, which is more complex and noble than the first, but less so than the third. The third is the moral stage, which is less general, but more complex and noble than either of the others. Thus, while retaining his old idea of social development through the militaristic, juristic and industrial stages; he casts aside his former theory of the three stages of human knowledge,—the theological, metaphysical and scientific. The major part of the third volume is devoted to an evaluation of the contributions to social progress made by the social organizations of the past through their religious forms and ceremonies.

The fourth and last volume of the *Positive Polity* is "The Synthetical Presentation of the Future of Man," and involves a presentation of the religion of humanity in all its details, as well as the scheme for its introduction as the world religion. The Great Being Humanity is defined as "the whole constituted by the beings past, present and future, which co-operate willingly in perfecting the order of the world." It is, therefore, represented by the dead, who collectively represent humanity. Fetichism is brought into its service because fetichism in inculcating a love for external objects, paves the way for enhancing the altruistic emotions, and thus develops love of humanity. Immortality is subjective, and means incorporation in the Great Being Humanity, and a living on thus in the memory of succeeding generations. There are two methods of worship in this religion: one, the worship of Humanity itself; the other, adoration of its personification in woman as wife and mother.

In place of the confirmation rites of Catholicism, the priesthood of humanity will administer to each person nine sacraments. The first of these is known as presentation, and takes place at birth. The priests accept the newborn child presented by the parents, and promise to prepare it for the service of the Goddess of Humanity. The second is initiation, and is the transference of the fourteen year old child from the maternal care to the systematic training of the priesthood. The third is admission and is the authorization of the twenty-one year old youth or maid to serve humanity. Destination, the fourth

sacrament, is administered at the age of twenty-eight, and is the consecration of the man to his life work. In the case of woman, this sacrament is combined with the fifth sacrament of marriage, for woman has no other destination. The sixth sacrament, maturity, which takes place at forty-two, impresses upon man the stern responsibility of service to humanity. Twenty-one years later comes the seventh sacrament, which is called retirement, and which limits personal influence to counsel and advice. The eighth sacrament of transformation replaces the old Catholic death bed ceremony, and consists of a just summing up of a man's life and his commitment to the other world. Seven years after death is the ninth and last sacrament of incorporation, which is the final decision of the priesthood as to whether the dead person is to be incorporated in the Great Being Humanity, or consigned to oblivion.

The other distinguishing features of the religion of humanity and the Positivist regime, are the supreme power of the priesthood, the calendar previously mentioned in connection with the Positivist Catechism, and the annihilation of all books except the 150 volumes (mostly poetry) which Comte deemed worthy of preservation in his Positivist Library.

It is the extreme contradiction between Comte's positions in his two great works that his biographers have tried to reconcile, and psychologists have attempted to explain. Amid these diverse opinions, there is at least one point of agreement,—that his relations with Clotilde de Vaux were the turning point in his career. Theirs was indeed a strange companionship. Mme. de Vaux was born of a highly respectable family, and possessed a delicate, spirituelle beauty combined with native intelligence and rare charm of personality. Shortly after her marriage, her husband had been convicted of capital crime and sentenced for life to the galleys, so that she was living in the same moral freedom and personal isolation as Comte himself. The sympathy which the similarity of their positions enabled them to feel so poignantly for each other soon grew into a deeper attachment, but though their meetings were frequent and they exchanged daily letters which breathed the tenderest devotion, their love never found any fuller expression. It was only a year after their first meeting that Clotilde died, but her memory could never expire in Comte's mind. (5.) "When Beatrice died, Dante's grief filled her room up with something fairer than the reality had ever been. There is no idealizer like unavailing regret, all the more if it be a regret of fancy as much as of real feeling. She early began to undergo that change into something rich and strange in the sea of his mind which so completely supernaturalized her at the last." (Lowell: *Among My Books, Vol. II: Dante.*) Even so, Clotilde became for Comte what his favorite heroine, Beatrice, had been to Dante.

"Dear angel," he says, after her death, "I can only adore you by trying to serve better the Great Being in whom I know you are irrevocably incorporated."

But this worship for Mme. de Vaux passed all bounds of rationality and became fetichistic in its import. The arm chair in which she was wont to sit became his altar where three times daily he prayed to her divine memory; he made weekly pilgrimages to her tomb even as the palmers of old sought the holy sepulchre; a flower she had worn, her "sacred letters," became so impregnated with the thought of her as to suggest her presence; her illiterate servant girl, Sophie Bliot, became idealized in Comte's eyes because she had served her mistress so faithfully, and finally, he repeated every morning of the nine years during which he survived her death the following poem written by Mme. de Vaux, which he characterizes as "graceful verses, whose sweetness might well have been envied by Petrarch." (4.)

THE THOUGHTS OF A FLOWER

O ! thanks my good fate ! to be loved I am born !
 Let mortals still rail against thee in their might,
 Let pride to the foot of thy altars invite,
 I have my perfumes and my morn.

I have the first glance of the sovereign of day,
 His fiery kiss, his splendid array;
 A sisterly smile young Aurora bestows;
 I have the fresh breeze, and the flavor that flows
 From the dewdrop that rests on my chalice's brim;
 I've the sunbeam that sports on the precipice's rim,
 I've the magical picture, the unrivalled display,
 Of the universe opening the portals of day.

The coldness of mortals my life cannot blight;
 So sweetly I sleep on the breast of delight;
 Protected by nature, whose wealth I ne'er miss,
 Transported I wake to her banquet of bliss.

To beauty a charm I have often supplied,
 On a pure heart my pure light shines,
 Pleasure in garlands me entwines,
 And happiness fastens me to its side.

When the nightingale rides
 On my stem in its play,
 That its song may have sway,
 All nature subsides,
 Its secrets love whispers to me,
 Positions so sweet I defend,
 My aid in its mysteries lend,
 Of all modest hearts I'm the key.

O, sweet fate, if unholy sighs
 Had power the course of thy laws to move,
 Alone here below, in my transparent guise,
 I would bud at the breath of love.

To storms that defile,
 Surrender me never,
 May the flowers ever
 At love's festivals smile.

It is no wonder that Comte's religion of Humanity set forth in his Positive Polity has been considered simply his commemorative worship of Clotilde de Vaux extended to a universal scale. Dumas considers it a revival of his early training in the rites of Catholicism, in which he substituted Mme. de Vaux for the Virgin Mary, and transformed his human love into a mystic form. (7: pp. 193-246.)

"His was a love always sensual, and Clotilde, while exciting it to the utmost, repressed it. He became voluntarily chaste after knowing her. Comte's religion had an inspiring motif and an universal one, but his love for Clotilde transformed it Finally, the glorification of woman is the glorification of Clotilde, and the social rôle which he attributes to them is the rôle which she played in his own life." (7: pp. 198-210.)

This interpretation of the rôle Clotilde played in Comte's life and in the development of his Positivist Religion is fundamentally correct, but Dumas misses a connection finer and more subtle than that of mere repression and sublimation of the sex instinct in its simple form. Clotilde drew Comte's affections irresistibly to herself not through sympathy or mere physical attraction, but because she was the realization of his mother ideal. His mother had been a noble woman, enshrined in her holy Catholic faith. Clotilde was similarly pure and true in thought and act. Just as his Oedipus complex had prevented him from feeling any real love for his wife, although she satisfied his sensual nature, so it bound him irrevocably to the woman who never yielded to his passionate desires. Comte himself had some dim intimation of this mother identification, for he writes in the preface of his Positive Polity:

"A noble and tender mother, whom I lost fourteen years ago, was the first real source of all my essential qualities, not merely of emotions, but also of practical and even of intellectual capacities. Nevertheless, I have now humbly to confess that I never felt for her that love which her worth and her sorrows claimed; and that even what love I felt was never

sufficiently shown, owing to the false shame of seeming too fond which is stimulated by modern training. But the worship of my Clotilde has at last aroused in me veneration for my honored mother. Her image and that of Rosalie Boyer are more and more intimately mingled, both in my weekly visits to the cherished tomb and in my daily prayers." (5 p. xviii.)

It is in this Oedipus complex, also, that we find the key to Comte's religious conception. Had he been wholly the introvert, his deeper subconscious life would have found its expression in the type of religion common to so many other philosophers,—the cosmic interpretation mentioned earlier in this paper. But in his case, the long repressed mother love shaped his unconscious projection in religion. Everywhere, woman—the maternal type—is the supreme ideal. The symbol of the *Grand Être* Humanity is a woman of thirty with her son in her arms. (Clotilde had died at the age of thirty-two). Likewise, the *Grand Fétiche* is mother earth. And the qualities which Comte would have every human being cultivate and make the guiding principle of his life are the mother qualities,—sympathy, unselfish love and tender helpfulness.

It is true that in its worship of the madonna Comte's religion of humanity resembled the Catholic faith. Moreover, the supreme power of the priesthood to judge both the living and the dead; the Positivist Calendar with its religious festivals and commemorative worship of the sainted dead who have best served society; the nine social sacraments which replace the old rites of baptism, confirmation and death bed confession; the incorporation of fetichism which is so strongly suggestive of relic worship;—all these are reminiscent of Catholicism. Yet these parallelisms account only for the form which Comte's religious enthusiasm assumed; they do not explain its ultimate origin. The deeper source, as has been intimated, is the necessity of objectifying those lower levels of the subconscious formed by phyletic experience, and furnishing an outlet for long repressed infantile desires.

In the final analysis, it is safe to conclude that Comte was essentially the introvert, but three times during his career, his unconscious emotional life came to the surface, resulting each time in a conflict that led to a mental derangement which lasted until his intellectual faculties could resume their interrupted sway. In his third and last crisis, which occurred just after he had fallen in love with Clotilde de Vaux, there were several complicating factors which reinforced his extrovertive functions. As a result, the latter remained in power, and found expression in his exaggeration of the affective element

as the supreme good of all existence, and in his religious doctrines. It may be that his system of commemorative worship was doubly motivated, and that it not only gave him an opportunity of expressing his love for Clotilde, but that it also gave him assurance that he, too, would be honored in death as he never had been in life. This once supreme will to power made one other attempt to assert itself, resulting in Comte's attempt to place himself in the office of the High Priest of Humanity;—if he can no longer be the supreme intellectual being, he will at least become the highest moralist, the great religious pontiff of the whole world.

It is time to recapitulate the interacting conditions which united to reinforce the last great outbreak of Comte's affective life. In the first place, Robinet assures us that he had that mental diathesis, that innate instability of the nervous system, which predisposes its possessor to the neurotic conflict. (16:pp. 307-315.) During adolescence, which is normally a period of intense emotional sublimation, of imaginative day-dreams and heroic idealizations, Comte had sternly repressed all these natural tendencies, making reason his one ideal. The period just previous to senescence with its entire loss of passion, is in a sense a repetition of adolescence, for it is conditioned by a resurgent outburst of affectivity and a corresponding lack of control. It is a phylogenetic regression, in which old feelings and the beliefs grounded in them rise again, and dominate thought, and will not submit to its rule. (18: pp. 180-181.)

It was at this critical period of his life, when he was just forty-seven years of age, that Comte met Clotilde de Vaux. Shaken to the depths of his being already by the emotional disturbances due to his age and reinforced by the physical repressions of his youth and early manhood, Comte now attempted to impose upon himself the additional burden of physical repression, that he might be worthy of the affection of the woman who was for him the embodiment of all purity and goodness, the personification of his unconscious mother ideal. Whether Clotilde also awakened that phyletic image imbedded within his deeper subconscious life—the sexual ideal formed by his racial memories—we can only speculate, though the deeply religious feeling which he now felt for the first time would seem to indicate that such was the fact. It is quite possible, however, that this is sufficiently explained by his long repression of the deeper subconscious life which ordinarily finds expression through the medium of religion, and its consequent increase in energy.

This we know,—that Comte's pent-up emotional life would no longer be denied, but rushed forth in a mighty torrent, sweeping all before it, projecting itself upon all objects of the external world upon the slightest pretext, and creating for itself new outlets in a world made half of phantasies. And so he seized upon religion, which has always been the supreme emotional outlet of the human race, creating for himself and for mankind, a faith expressed largely in the terms of the old Catholic belief of his infancy, and affording the highest gratification of his human love. As the affective forces of his life grew stronger and stronger, he came to have that hatred of the intellectual and of scientific research which so puzzled his followers, until at last he planned a general holocaust of all books except the few which he deemed worthy of preservation in the Positivist library. Thus he ended his brilliant career in a storm of emotion which never allowed him to make proper adjustments to life because his adaptive functions had so long been governed entirely by thought.

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ON "RETIRING" AND "ADVANCING" COLORS

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Doubtless it has often been noted that various colors in the same plane do not appear to be in the same plane. The artist speaks of retiring and advancing colors; and some painters who are fortunate in being acquainted with the scientific facts of color have utilized this phenomenon in attempts to create the illusion of the third dimension in paintings. The phenomenon is quite strikingly apparent to the author when viewing the projected image of a lantern slide on which there are words in various colors as is commonly the case with slides used for advertising purposes. Never having seen any quantitative data on the subject, it appeared of interest to ascertain the magnitude of the effect and whether or not the impression was generally the same for all observers. The work is by no means complete and may cover ground that has already been covered but a search has not yielded any information that would indicate this. This work has been reported in abstract¹ under the title of "stereoscopic" colors. It appears that this describes the phenomenon and its practical uses quite satisfactorily.

The apparatus consisted of two wooden boxes, each containing a tungsten lamp and each equipped in front with an aperture covered with opal glass. Before the diffusing glass in one box were placed a red filter (fairly high purity) and an opaque card in which a plain letter X was cut. The other box was similarly equipped with a blue filter (fair purity with no red transmission) and a diaphragm on which a plain letter E was cut. The height of the letters was 2.2 cm. and the width was 1.5 cm. The boxes, which were painted white inside and black outside, were arranged on tracks side by side so that they could be moved independently to and fro by the observer by means of strings and pulleys. In a dark-room these two colored letters stood out in space; and, while one was kept in a fixed position, it was possible for the observer to move the other to and fro until the two appeared

¹ *Jour. Frank. Inst.* 183, 1917, p. 773.

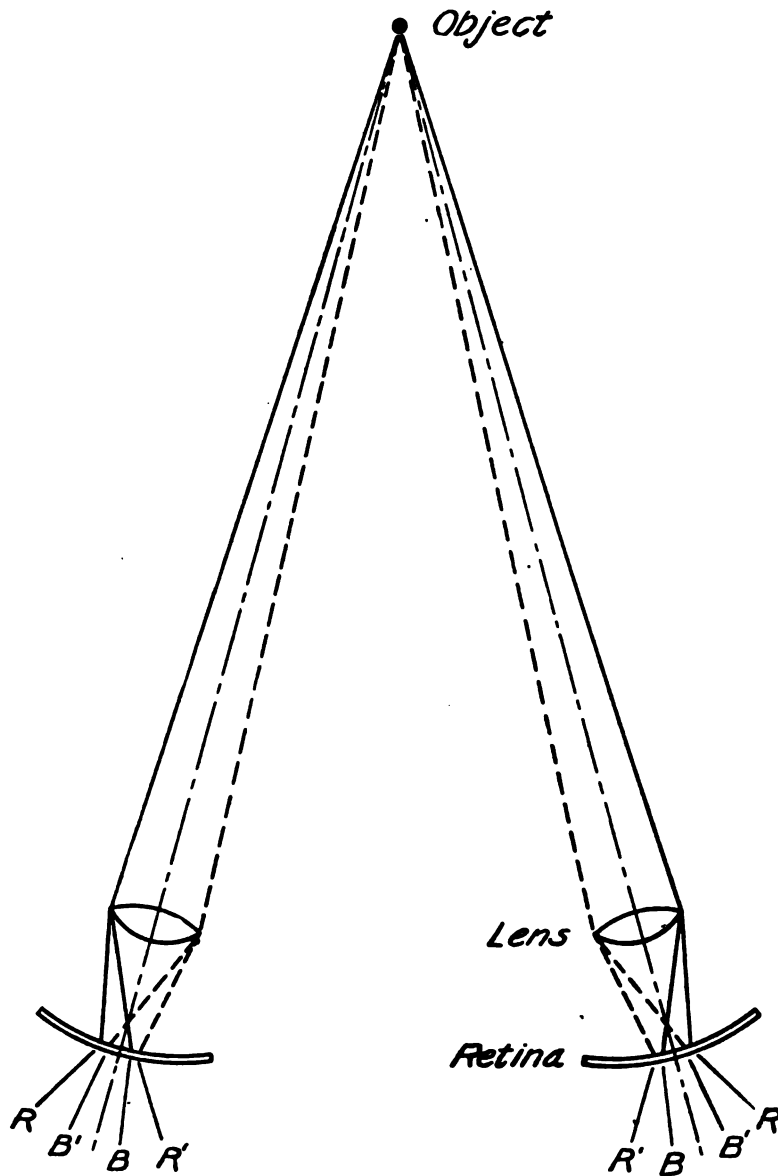


FIG. 1.—Illustrating a possible explanation of 'stereoscopic' colors.

in the same plane. In obtaining the data given in the table, the red X was moved. The observer was seated at various stations from 2.5 to 7.25 meters from the fixed blue E. At each station at least ten independent settings were made in a series. None of the observers, with the exception of *M. L.*, were acquainted with the phenomenon under consideration.

In the table, data are presented for nine observers. At the top of each column is shown the distance in meters of the observer's eyes from the blue E; and the figures in the columns indicate the distance in centimeters which the red X was moved behind (+) or in front of (—) the blue E in order that the two would appear in the same plane.

Total distance in metres	2.5 cm.	4 cm.	5 cm.	6 cm.	7.25 cm.
<i>M. L.</i>	2.8	16.0	24.6	39.8	57.7
<i>H. K.</i>	4.8	13.7	21.0	31.7	46.2
<i>F. G.</i>	1.6	5.3	7.6	5.3	12.5
<i>P. H.</i>	3.1	15.1	8.4	35.6	49.5
<i>L. M.</i>	2.6	4.5	13.4	14.4	18.3
<i>E. K.</i>	7.4	28.2	50.9	22.6	71.7
<i>H. P.</i>	5.1	2.4		23.2	17.4
<i>L. C.</i>	—0.4	—1.9	1.4	8.9	—2.7
<i>G. H.</i>	—7.4	—18.5	—34.0	—37.6	—49.7

It is seen that in most cases it was necessary to move the red X farther away than the blue E in order to make both appear in the same vertical plane perpendicular to the line of sight; and that this distance generally increased with the distance of the observer's eyes. It is quite possible that through training the results for a given observer would become more consistent but even the degree of consistency indicated in the data obtained from observers, who until after the experiments were not acquainted with the phenomenon, appears quite striking. The phenomenon is somewhat fluctuating but the results for a given observer usually indicate a definite trend. Computations from the data by *M. L.* indicate that chromatic aberration in the eye could account for the effect but the negative values for the last two observers and other considerations complicate this explanation.

Observer *M. L.* performed the following experiments, the results of which were confirmed by other "positive" observers who were used. If the two letters were placed in the same plane they did not appear in the same plane but, by nearly closing the eyelids, they appeared to move into the same plane. Similarly when the two objects were placed so that they appeared in the same plane, on nearly closing the eyelids, the

red X appeared to move into its true position; that is, back of the blue E. When two very small artificial pupils were placed respectively before each eye the blue E could be made to appear either behind or before the red X by moving the pupils farther apart or nearer together. It appeared that, for those who normally saw the red X in front of the blue E, when the small artificial pupils were moved closer together the blue E apparently moved forward very strikingly; when the pupils were separated a trifle more the blue E moved backward. Through these small artificial pupils both images appeared simultaneously in focus at all times, which of course was not true with the natural pupils. On turning the head slightly, results similar to the preceding were obtained. Differences in relative brightness and shape of the colored characters seemed to influence the magnitude of the results somewhat but the effect was never reversed. The effect could not be observed with certainty with one eye.

In order to give an idea of the consistency of the individual settings the mean variation from the mean was computed for a number of cases. In general this was higher for the inexperienced observers but from *M. L.* it was 0.39 cm. (14 per cent.) at the 2.5 meter distance. It decreased with the distance of the observing station and was 1.27 cm. (2.7 per cent.) at the 7.25 meter station. This indicates that the phenomenon was very definite.

A complete explanation can hardly be justified on the basis of the present data but owing to an indefinite interruption of the work an hypothesis will be briefly presented. It appears possible that the different refractive indices of the eye media for radiant energy may play a part in causing this effect. These may account for a displacement of the colored images which gives rise to the "stereoscopic" effect quite in the same manner as in ordinary vision. The point may be brought out more clearly by means of Fig. 1. Assume that only the temporal portions of the eye lenses are used; then if the object is blue, the images will be found at B (solid lines) and if the object is red, the images will fall at R. Naturally the blue object will seem to be farther away than a red object in the same position since these respective positions of the images generally correspond to far and near objects. If the nasal portions of the lenses are considered the dashed lines may be referred to, the blue and red images falling at B' and R' and the reverse effect is obtained. In this case the effect will be reversed thus accounting for the results obtained by moving the small artificial pupils further apart or nearer to-

scowling, gloomy, drunkard, swindler, illness, cruel, selfish, ugly.

Indifferent: fibre, gravel, balance, cover, counter, kettle, measure, number, oven, sentence, ladder, squirrel, jackknife, basket, soap, reindeer, ribbon, knocker, evergreen, horse.

These sixty words were mixed in an irregular order, but so that not more than three of the same feeling-tone followed one another in immediate succession. The entire list was then presented with the usual instructions^a for free associations to each of 17 women and 18 men. The subjects were divided between the two writers, both of whom acted as experimenters. The times were measured by a stop-watch.

The medians were computed for each of the three kinds of words; and the ratios were found for each subject of the 'pleasant' median to the 'indifferent' median $\left(\frac{P}{I}\right)$, and of the 'unpleasant' median to the 'indifferent' median $\left(\frac{U}{I}\right)$.

The decision as to whether the pleasant or the indifferent words had the greater tendency to cause long association-times will depend upon the distribution of the subjects in regard to the ratio $\frac{P}{I}$. If this tends to exceed 1, then the pleasant words

tend to cause longer association-times; if the opposite, the indifferent words tend to cause the longer times. Similarly the decision as to the unpleasant and the indifferent words will depend upon the distribution of the subjects with regard to the ratio $\frac{U}{I}$. In examining these distributions, however,

it is obvious that a value of $\frac{U}{I}$ or $\frac{P}{I}$ equal, for example, to 1.5

$\left(\frac{3}{2}\right)$ would be balanced by one equal to 0.666 $\left(\frac{2}{3}\right)$ and not by

one equal to 0.5; while a ratio of 0.5 $\left(\frac{1}{2}\right)$ would be balanced

by one of 2.0; and so on. Now the logarithm of 0.666 is equal and opposite in sign to the logarithm of 1.5; similarly the logarithm of 0.5 is equal and opposite to the logarithm of 2.0, and so on. Therefore in plotting the distributions we have used the logarithms rather than the direct ratios themselves.

^a Whipple, G. M. *Manual of Mental and Physical Tests*, Part II. p. 55.

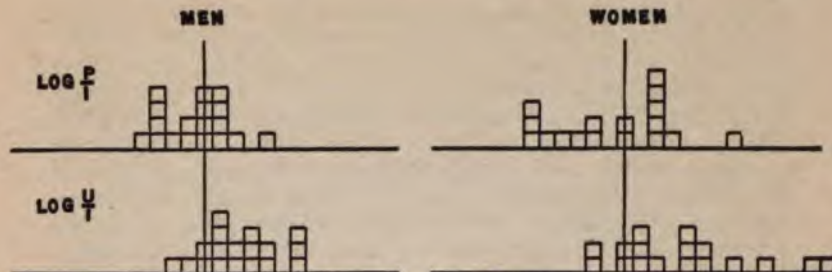


FIG. 1

Figure 1 presents these plots for the men and women separately. Each square represents an individual, and its distance to the right or to the left of the centre line represents the value, plus or minus, of the logarithm of the ratio for that individual. Thus squares to the right of the centre line mean individuals with ratios greater than 1, squares to the left of the centre line individuals with ratios less than 1.

Examining first the two $\frac{P}{I}$ plots, we see no clear tendency in either case for $\frac{P}{I}$ to be more often either greater or less than 1. Turning, on the other hand, to the $\frac{U}{I}$ plots, we see a very decided tendency in both cases for $\frac{U}{I}$ to be greater than 1. Thus the pleasant words as stimuli were not noticeably different from the indifferent words; but the unpleasant words showed a decided tendency to cause longer association-times.

This result contradicts Birnbaum's negative finding. A question arises, however, as to whether the longer times obtained for the unpleasant stimulus-words may not have been due to true complexes rather than to mere simple unpleasantness. Words like bankrupt, snobbish, drunkard, etc., may have been connected with subjective emotional histories. In such a case the results would merely point to the already well-established fact that complexes as such tend to lengthen association-times. They would not answer our original question as to the effect of simple feelings upon association-times.

In order to examine with greater precision this original question, a more carefully selected list of words was used. The words were chosen as appealing to several distinct depths of

feeling. Thus of thirty pleasant and thirty unpleasant words used, ten in each group referred to simple sense qualities only, ten or more of the pleasant to success, and ten of the unpleasant to failure; while the last ten of each group referred to love and home on the one hand, and to death and objects of disgust on the other. If it should appear that the simple unpleasant sense qualities were just as provocative of lengthened association-times as the words dealing with complexes, such as failure, death, and disgusting objects, we should conclude that unpleasantness *as such* really lengthens association-times.

TABLE I

Pleasant	Unpleasant	Indifferent
<i>Sense</i>	<i>Sense</i>	<i>Sense</i>
smooth	rough	still
fragrant	dusty	round
sunny	overcast	crooked
sparkling	dull	high
silvery	dingy	narrow
sweet	sour	swinging
airy	stuffy	tall
clean	dirty	bent
juicy	bitter	twisted
soft	chilly	wide
<i>Success</i>	<i>Failure</i>	
victory	defeat	motion
success	failure	incident
triumph	remorse	group
genius	fool	people
career	shame	occupation
reward	disgrace	occasion
achievement	guilt	change
praise	blame	individual
skill	stupidity	action
applause	scorn	feeling
<i>Love</i>	<i>Death</i>	
courtship	grief	business
wedding	funeral	meeting
lover	corpse	stamps
kiss	coffin	student
bridesmaids	undertaker	writing
<i>Family-Home</i>	<i>Disgust</i>	
sister	snake	hill
mother	sweat	water
family	worms	woods
parents	sores	stones
home	swill	road

Before presenting our results we may mention several further improvements in method. In each group of words, pleasant, unpleasant, and indifferent, the same proportion of nouns and adjectives was used, as was not the case in the previous experiment. This was to allow for the fact discovered by Crane⁴ that adjectives, as such, tend to cause shorter association-times than do nouns. Also the proportion of concrete and abstract terms was kept as nearly as possible the same for each group of words. Table I presents the three groups in parallel columns. Words supposed to be of equal difficulty appear in the same horizontal line.

In presenting the lists, the words were mixed in the following ways. The words in each sub-group, such as 'sense,' 'success,' 'love,' 'disgust,' were evenly distributed over the entire list. The words of the three different feeling-tones were irregularly mixed, but so that not more than three words of the same feeling-tone followed each other in immediate succession. For not more than two subjects, however, was the exact order of presentation the same.

In order to eliminate the personal equations of the experimenters, an electric starter and stopper was used for the stopwatch.⁵ This was connected with a falling shutter exposure apparatus and a lip-key. The stimulus-words were presented

TABLE II

TOTALS

30 pleasant, 30 unpleasant, and 30 indifferent words

Men				Women			
Name	P	U	I	Name	P	U	I
A.....	.82	.81	.77	K.....	1.17	1.40	1.30
B.....	.99	1.26	1.15	L.....	1.47	1.60	1.54
C.....	1.07	1.23	1.13	M.....	1.01	1.08	1.03
D.....	.94	1.02	1.00	N.....	.81	1.04	.91
E.....	1.19	1.25	1.15	O.....	1.29	1.47	1.38
F.....	1.53	1.68	1.63	P.....	1.41	1.70	1.43
G.....	1.12	1.08	1.10	Q.....	.98	1.08	.90
H.....	1.53	1.63	1.56	R.....	1.53	1.54	1.50
I.....	1.15	1.20	1.08	S.....	1.10	1.67	1.08
J.....	1.70	1.48	1.55	T.....	.87	1.30	.95

⁴ Crane, H. W. *Psychological Monographs*, XVIII, 1915, whole No. 80.

⁵ In the previous experiment, the times obtained by one of the experimenters averaged considerably shorter than those obtained by the other. The size of these personal equations led to the suspicion that the positive results obtained might have been due in part to unconscious influences exerted by the experimenters themselves.

TABLE II—*Continued*

SENSE

10 pleasant, 10 unpleasant, and 10 indifferent words

Men				Women			
Name	P	U	I	Name	P	U	I
A.....	.90	.77	.60	K.....	1.07	1.17	1.30
B.....	.85	1.05	1.00	L.....	1.30	1.50	1.45
C.....	1.15	1.10	1.00	M.....	.99	1.05	1.03
D.....	1.00	.90	.80	N.....	.75	1.00	.94
E.....	1.00	1.30	1.03	O.....	1.26	1.40	1.25
F.....	1.40	1.33	1.40	P.....	1.26	1.40	1.30
G.....	1.17	1.05	1.02	Q.....	.83	.95	.60
H.....	1.43	1.60	1.55	R.....	1.58	1.26	1.50
I.....	.90	1.20	.99	S.....	1.03	1.23	.80
J.....	1.50	1.50	1.70	T.....	.75	1.10	.85

SUCCESS-FAILURE

10 pleasant, 10 unpleasant, and 10 indifferent words

Men				Women			
Name	P	U	I	Name	P	U	I
A.....	.83	.80	.87	K.....	1.35	1.40	1.33
B.....	1.05	1.35	1.25	L.....	1.65	1.63	1.70
C.....	1.10	1.40	1.50	M.....	1.10	1.06	1.06
D.....	1.05	1.20	1.33	N.....	.93	1.10	.85
E.....	1.15	1.30	1.14	O.....	1.40	1.65	1.54
F.....	2.10	1.90	1.77	P.....	1.50	1.75	1.43
G.....	1.18	1.07	1.03	Q.....	1.00	1.00	.94
H.....	1.75	1.60	1.80	R.....	1.30	1.80	1.77
I.....	1.40	1.53	1.18	S.....	1.45	1.85	1.55
J.....	1.83	1.50	1.90	T.....	1.55	1.30	1.03

LOVE, FAMILY—DEATH, DISGUST

10 pleasant, 10 unpleasant, and 10 indifferent words

Men				Women			
Name	P	U	I	Name	P	U	I
A.....	.75	.85	.90	K.....	1.00	1.57	1.37
B.....	1.00	1.30	1.17	L.....	1.30	1.60	1.57
C.....	.95	1.55	1.00	M.....	.90	1.17	1.00
D.....	.83	1.10	1.07	N.....	.80	1.05	.85
E.....	1.15	1.18	1.22	O.....	1.20	1.45	1.40
F.....	1.15	1.75	1.63	P.....	1.37	2.00	1.70
G.....	1.04	1.10	.98	Q.....	1.03	1.55	1.20
H.....	1.80	1.70	1.37	R.....	1.40	1.60	1.23
I.....	1.17	1.08	1.20	S.....	1.00	1.60	1.20
J.....	1.60	1.45	1.22	T.....	.82	1.54	.87

visually, and the subject in reacting with associated words used the lip-key. Several practice words were given before the main series.

The median times for the 10 men and the 10 women experimented upon are shown in Table II. The ratios for these times, plotted as in the preceding case, are shown in Figure II.

The plots at the top show the complete results when the medians were computed from the total 30 words of each feeling-tone. It is clear at once that these data substantiate the findings of the previous experiment. The $\frac{P}{I}$ results indicate no clear tendency for shorter or longer times for pleasant words than for indifferent words. The $\frac{U}{I}$ results, on the other hand, for both men and women, point very decidedly to longer times for the unpleasant words.

Turning now to the partial results, and first to those for the words referring to sense qualities, we note decided evidence of longer times for the unpleasant words than for the indifferent, but no evidence of either consistently longer or shorter times for pleasant words than for indifferent ones. This is important. It solves the main problem we set out to investigate, for it proves that *simple unpleasantness as such lengthens association-time*.

Turning to the other partial results, we note first, that in the case of 'success' and 'failure' the evidence for longer times for the unpleasant words is lacking for the men, though present for the women. This fact seems to be but an accentuation of a characteristic common to all the results; an examination of each set of plots shows that in every case the evidence for longer times for the unpleasant words was more pronounced for the women than for the men.⁶ This holds for the preceding experiment as much as for the present one.

Secondly, we note in the last group of plots a tendency for the women to have shorter times for the pleasant words than for the indifferent words. This may have been the result of mere chance, or it may point to a real though very slight tendency for pleasant words to cause shorter times than the indifferent words. In fact a closer examination of the $\frac{P}{I}$ plots lends some support to the latter alternative, at least in the

⁶ In this connection we may note that Haggerty and Kempf (*Amer. Jour. of Psychol.*, XXIV, 1913, pp. 414-425), found a greater tendency for suppression and substitution among women than among men.

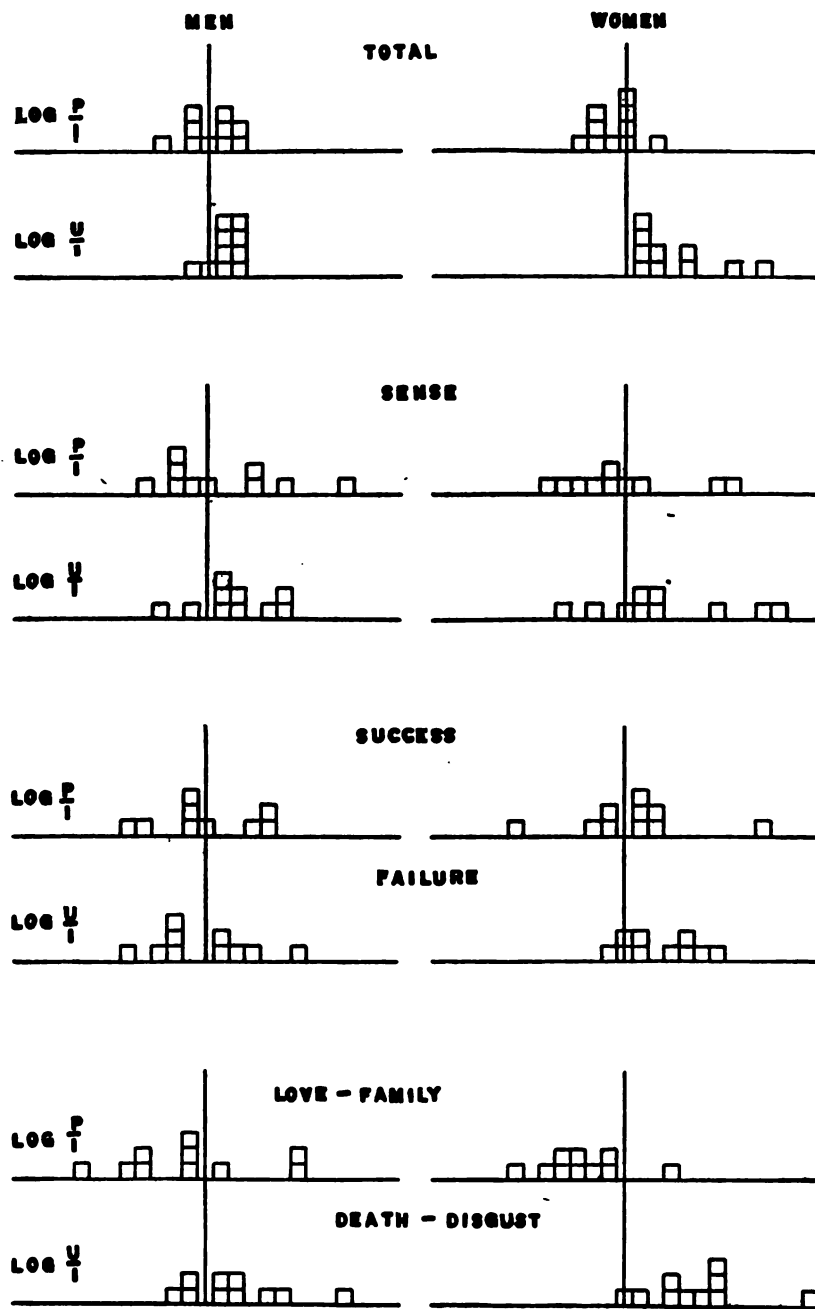


FIG. 2

case of the women. The evidence in all the cases, however, is very slight. It can be considered only as suggesting a fruitful problem for further investigation, not as indicative of an established fact.

To sum up: 1. Names of simple but unpleasant sense qualities, used as stimuli, tend to lengthen association-times quite as much as do unpleasant words of deeper emotional significance. 2. Women show the tendency to be affected by unpleasant stimulus-words more than do men. 3. There is evidence, in the case of the women, to suggest that pleasant stimulus-words may tend to cause shorter association-times than those caused by indifferent stimulus-words. The evidence for this point, however, is slight.

PROLONGED INFANCY—ITS CAUSES AND ITS SIGNIFICANCE

SOME NOTES ON MR. FISKE'S THEORY

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In Selma Lagerlöf's book, "The Wonderful Adventures of Nils," there is recorded a conversation between a domestic goosey-gander and the leader of a flock of wild geese. The goosey-gander is desirous of becoming a member of the troop of wild geese and she is asked for her credentials:—

"There isn't much to tell about me," said the goosey-gander. "I was born in Skanor last spring. In the fall I was sold to Holger Nilsson of West Vemminghog, and there I have lived ever since." "You don't seem to have any pedigree to boast of," said the leader-goose; "what is it then, that makes you so high-minded that you wish to associate with wild geese?" "It may be because I want to show you wild geese that we tame ones may also be good for something," said the goosey-gander. "Yes, it would be well if you could show us that," said the leader-goose, "we have already observed how much you know about flying; but you are more skilled, perhaps, in other sports. Possibly you are strong in a swimming match?" "No, I can't boast that I am," said the goosey-gander. It seemed to him that the leader-goose had already made up her mind to send him home. So he didn't much care how he answered. "I never swam any farther than across a marl-ditch," he continued. "Then I presume you're a crack sprinter," said the goose. "I have never seen a tame goose run, nor have I ever done it myself," said the goosey-gander; and he made things appear much worse than they really were.

The poor showing of the domestic goose against her wild sisters gives rise to some speculation as to the effect of domestication, and its resulting characteristic, dependence, on the animal and the species. The most prominent form of this dependence is that of the period of human infancy, the meaning of which has been interpreted for us by John Fiske. It is with this interpretation, and an attempt to point out a

possible new significance of this period of animal life, that this paper proposes to deal.

I. MR. FISKE'S THEORY

"It will appear that it was the lengthening of infancy which ages ago gradually converted our forefathers from brute creatures into human creatures. . . . Natural selection might have gone on forever improving the breed of the highest animal in many ways, but it could never unaided have started the process of civilization or have given to man those peculiar attributes in virtue of which it has been well said that the difference between him and the highest of apes immeasurably transcends in value the difference between an ape and a blade of grass. In order to bring about that wonderful event, the Creation of Man, natural selection had to call in the aid of other agencies, and the chief of these agencies was the gradual lengthening of babyhood."

"But this steady increase in intelligence, as our forefathers began to become human, carried with it a steady prolongation of infancy. As mental life became more complex and various, as the things to be learned kept on multiplying, less and less could be done before birth, more and more must be left to be done in the earlier years of life."

It is evident that Mr. Fiske's theory rests upon two suppositions: first, that progress was made possible by increased infancy; second, that as intelligence kept on increasing a longer period became necessary, that the animal might adapt itself to the increasingly complex mental environment. Progress is conditioned on infancy, and increased intelligence means increased complexity of environment.

II. THE MEANING OF ENVIRONMENT

Mr. Fiske's theory can be upheld provided only we are willing to grant the implied assumption that environment may mean one thing when applied to man and something else when speaking of other forms of life; while, on the other hand, it must be evident that natural environment, similar in all aspects for all of nature's creations, is the only meaning that can be taken into consideration in a purely scientific discussion of a type demanded by a subject of this nature.

There are but two instincts with which nature is concerned and which may be called natural instincts: self-preservation and reproduction. These are the only instincts that further

her sole purpose, that of maintaining and perpetuating her creations. Nature is impartial and not at all charitably inclined. She provides the organism with weapons—one as effective for its purpose as another—and lets it fight its own battles. To say that she was kinder to man than to the rest of animal life is to attribute to her a conscious purpose, which must be considered a non-scientific assumption. And in the "struggle for existence" can be included only those elements that go to maintain life, and procure food and shelter. So with environment, whether applied to man or to any other type of life, it can include natural surroundings only, that on which depends survival. We must conclude, then, that in a purely scientific discussion of the meaning of infancy as a period of adjustment to environment the esthetic, literary, and scientific inheritance and productions of the race can not be taken into account; for with these nature is not concerned. "We can not suppose," says Spencer, "that minor traits, exemplified among others by the aesthetic perceptions, can have been evolved by natural selection." (The Factors of Organic Evolution.) These must be considered as the result of man's attempt, after the dawning of intelligence, to better his conditions, and nature, "red in tooth and claw," is not concerned with bettering the condition of any animal beyond supplying it with the necessary weapons with which to maintain itself. It is beyond scientific belief that nature planned or designed anything specifically to serve man. All nature's creatures, including man, serve but themselves in so far as they carry out nature's purposes.

"She (nature) lends them every power in her possession and aids them with every tool at her command. She helps sexuality by lavishing the sexes with every kind of attraction for each other. For the other instinct she supplies the weapon for defense and quick alert wits. She lavishes such care on no other instincts, which shows their super-importance. Nature's sole purpose in all this activity is to produce, maintain, perpetuate life. She has no other purpose in view but this one. And this is as true of man as of the weed and insect. Man is held in no higher esteem by nature than is her lowest creation. One fulfills her purpose as well as the other." So if we are to determine scientifically the causes of infancy we can not include the scientific, esthetic, or literary attainments of the race. We can take into account only natural causes working through evolution and bearing upon that part of the environment only that has a direct effect on its physical preservation.

III. MAN AND THE STRUGGLE FOR EXISTENCE

Bearing in mind the elements that constitute the environment of an organism as those upon which depends its survival, let us compare the struggle for existence of man with that of lower forms of life. For subsistence the animal needs food, shelter, and safety from danger.

Food—Man obtains his food by planning for it; the animal by chance. The competition that man meets with in his search for food is of the mildest kind compared with that of the animal. He obtains his food as the reward of labor or intelligence; the animal by its wits, physical force, and at the risk of life. The animal is in constant danger of losing its life while trying to maintain it.

Shelter—Man has shelter provided for him; the animal has to seek it or make it. His shelter is also better protection from both weather and danger than that of the animal.

Danger—In both sleeping and waking hours the animal is constantly being preyed upon and in danger of its life. "The struggle for life among the birds and other wild creatures is so severe that the feeble and malformed, or the handicapped in any way, quickly drop out. Probably none of them ever die of old age. They are cut off in their prime. . . . They are always in the enemy's country; they are always on the firing-line; eternal vigilance and ceaseless activity are the price of life with them."

"Since these birds left Canada and northern New England last October they have probably traveled over two thousand miles, beset by their natural enemies at all times and places—in fields and marshes and woods; in danger of hawks and shrikes and cats by day, and of fowls and other prowlers by night; compelled to hustle for food at all times, and to expose themselves to a thousand dangers." (Burroughs, *Old Friends in New Places*, in *Under the Apple-Trees*.) Thus the animal is struggling not only for the means with which to maintain life, but for life itself. Man is subject to no such severe conditions.

IV. INTELLIGENCE, ENVIRONMENT, AND INFANCY

It is the purpose of this paper to prove that, in agreement with Mr. Fiske's theory, increased intelligence led to and resulted in a longer period of babyhood, but that, contrary to his conclusions, not the resulting complexity of the environment but its simplification as the result of the conquests of the growing intelligence brought about this result.

Man differs from all other animals in that (1) he has the greatest intelligence, (2) he is the weakest of all animals in proportion to his size, (3) he has the longest period of infancy, a period of weakness and dependence. The same distinctive characteristics exist among no animals a stage below that of man, which seems to point to the conclusion that there must exist a definite relation, a causal relation between them; that the one gave rise to the other.

As has been previously argued, with the single exception of perpetuating life the workings of nature are purposeless and without aim. When in the course of its development the animal happens to strike upon a feature that proves of advantage in its struggle for existence, that feature becomes a permanent instrument for the purpose of adaptation. Such may have been the case with intelligence. Its appearance was accidental and its consequent development due to its advantages as a means for the conquest of environment and therefore for survival. The action of intelligence upon environment made possible the modification of the environment to suit the animal, man, and not a change in the animal, in man, to suit the changing environment. Evolution, natural selection, seized upon mind, and thus physically man stopped developing. "In the whole animal world, as we have seen, every species is preserved in harmony with the slowly changing environment by modifications of its own organs or faculties, thus gradually leading to the production of new species equally adapted to the new environment as its ancestor was before the change occurred.

In the case of man, however, such bodily adaptations were unnecessary, because his greatly superior mind enabled him to meet all such difficulties in a new and different way. As soon as his specially human faculties were developed (and we have as yet no knowledge of him in any earlier condition), he would cease to be influenced by natural selection in his physical form and structure. Looked at as a mere animal he would remain almost stationary, the changes in the surrounding universe ceasing to produce in him that powerful modifying effect which they exercise over all other members of the entire organic world." (Wallace, *Selection Modified by Mind, in Social Environment and Moral Progress.*)

With mind as an instrument for the conquest of environment the struggle for existence was greatly simplified. "In order to protect himself from the larger and fiercer of the mammalia he made use of weapons such as stone-headed clubs, wooden spears, bows and arrows, and various kinds of traps

and snares, all of which are exceedingly effective when families or larger groups combine in their use. Against the severity of the seasons he protected himself with a clothing of skins, and with some form of shelter or well-built house, in which he could rest securely at night, free from tempestuous rain or the attacks of wild beasts. By the use of fire he was enabled to render both roots and flesh more palatable and more digestible, thus increasing the variety and abundance of his food far beyond that of any species of the lower animals. Yet further, by the simplest form of cultivation, he was able to increase the best of the fruits, the roots, the tubers, as well as the most nutritious of the seeds, such as those of rice and maize, of wheat and barley, thus securing in convenient proximity to his dwelling place abundance of food to supply all his wants and render him almost always secure against scarcity or famine or disastrous droughts." Man thus attained, by dint of mind, a position of pre-eminence above all other animals in obtaining food and shelter, safety from danger, and even to transform that which in nature is useless into things useful and fit for consumption.

We can now state our thesis as to the relation between intelligence, environment, and infancy. With intelligence acting on the environment in the manner above described, survival no longer depended on pure physical activity, alertness, and strength; and as the implements for gaining the means for survival kept multiplying and were transferred from generation to generation, the young of succeeding generations found it less and less imperative to exert as much energy as was necessary in previous ages for the accomplishment of the same end, because of the thus simplified environment; all this resulted in the loss of former physical strength, and with the progress of the ages, this inactivity kept accumulating into a lengthening period of physical weakness or infancy. "Changed conditions," says Darwin, "induce an almost indefinite amount of fluctuating variability by which the whole organization is rendered in some degree plastic." (*Origin of Species*.) And further, "Changes of any kind in the conditions of life, even extremely light changes, often suffice to cause variability." (*Animals and Plants under Domestication*.) Speaking of domesticated rabbits he says: "The want of exercise has apparently modified the proportional length of the limbs in comparison with the body. . . . In many cases there is reason to believe that the lessened use of various organs has affected the corresponding parts in the offspring. . . . Our domestic fowls, ducks, and geese have almost lost, not

only in the individual but in the race, their power of flight; for we do not see a chicken, when frightened, take flight like a young pheasant." (*The Variation of Animals and Plants under Domestication*.) If this is true of physiological parts there is no reason why similar disuse of once needed physical energy will not be affected in a similar manner.

V. INFANCY AND SURVIVAL

The earliest progenitors of the human race were pressed hardest in their struggle for survival; for, besides having to conquer an environment in its rawest and rudest state, they even lacked the most rudimentary implements for the purpose. The next generations, however, due to the experiences of their predecessors, gradually found the fight less and less strenuous and dangerous and so on through the life-history of the human race up to the present when nature yields up her richest treasures and fruits with the least physical exertion of man. As mind supersedes mere physical prowess for the conquest of nature's resources necessary for the subsistence of man, physical energy is being turned into mental power and this keeps gradually manifesting itself in a constantly lengthening period of physical helplessness. The advance of civilization, especially in its scientific aspects, manifests itself primarily by the tendency to extract out of nature the means for physical maintenance and comfort with the least expenditure of energy on the part of man. It is man's special privilege, by dint of possessing a creative intelligence, to be the ruler and master of his environment and not the slave of it, as are all the lower forms of life. In his physical development he is directly influenced in no way by his physical surroundings; for his intellect enables him to maintain life in every zone, to protect himself against his immediate environment, and even to prepare for future needs. On the other hand, the mechanical means of controlling temperature, light, and the means of obtaining food, preparing foods, and engaging in activities that require little muscular exertion, all have an indirect influence on him. Under primitive conditions of life, vigor of skin, of muscles, and digestive apparatus, were the chief factors in survival; while under modern conditions varied activity of the nervous system is the only requirement. Under modern conditions, however, survival no longer depends on an adjustment to nature's forces or changes which invariably involve physical reaction, but on the contrary, man modifies his environment so as to make nature minister to his needs

and even his comforts with the least possible expenditure of his physical energy. "The discoveries of ancient and modern navigation and the domestic history or tradition of the most enlightened nations represent the human savage naked both in mind and body, and destitute of laws, of arts, of ideas and almost of language. From this abject condition, perhaps the primitive and universal state of man, he has gradually arisen to command the animals, to fertilize the earth, to traverse the ocean and to measure the heavens."

VI. CONCLUSION

It is true that infancy is a period for adjustment. It is also true that the individual needs a long time for the work of learning man's vast acquirements in the arts and the sciences. But learning and dependence are not one and the same thing. Because the human infant has a wide intellectual adjustment to make is no reason why he should be unable for a longer time than any other animal to supply the means for daily living; for we must bear in mind that, as we have shown before, the intellectual part of the environment does not concern nature. In accordance with her purposes the mastery of that environment is not necessary for the maintenance of life. Furthermore, infancy can not be the result of natural selection and have caused the conversion of brutes into human beings, as Mr. Fiske would have it, because, first, nature can not be said to have purposed the creation of man, and, second, because infancy, being a period of weakness, is against her very order of things. Nature tolerates no weakness and to maintain that she is responsible for its prolongation is to maintain that she is defeating her own purpose. In nature, "Youth is a perilous time in the life of animals. The young things, with their imperfect organs, with their relics of stages that were fitted to the environment of a remote ancestor, but are out of gear with existing conditions, are hampered with the cumbrous scaffolding of the past and can offer feeble resistance to accidents and diseases. They are a ready prey for a world of hungry enemies. It is in the first place imperative that this period of feebleness should be passed through as quickly as possible." (Mitchel, *The Childhood of Animals*.)

AN OBJECTIVE MEASURE OF ATTRIBUTIVE CLEARNESS¹

By EDNA E. CASSEL and K. M. DALLENBACH

Many efforts have been made and many methods have been used to discover a reliable measure of attention: a problem which Külpe long ago characterised as "one of the most important . . . that await solution. . . ." ² Its attractiveness lies in the fact that it is of as great significance for practical and applied purposes as it is for theoretical and systematic psychology.

Since Geissler has reviewed the work done up to 1909,³ we may dispense with an historical introduction, and give merely a summary of his conclusions. He found that the methods employed fall into six classes. "The first five may be classed together as methods of expression, analogous to the physiological methods employed in the investigation of the affective processes. According to these five methods the degrees of attention may express themselves in changes of (1) peripheral vision; (2) muscular strength; (3) liminal and differential sensitivity; (4) reaction-time; (5) accuracy of work. The sixth method may be likened to the method of impression. By a series of graded distractors, different degrees of attention are to be induced in the observer, and he is afterwards to report which degree he experienced."⁴ From an examination of the published studies, Geissler concluded that the results are equivocal, and that for one reason or another the methods themselves are inadequate to the problem. "Although much effort has been spent upon it [the problem of measuring attention], we are still far from a satisfactory solution."⁵

Geissler, at Titchener's suggestion, adopted a new method. He proposed to measure attention in terms of attributive clearness, the single characteristic of attention upon which all writers, theoretical as well as experimental, seemed to be agreed. The attempt thus made yielded positive results, and the method itself seemed so promising that it was extended by Dallenbach to the fields of auditory and cutaneous sensation.⁶ Confirmatory results were obtained in both sense departments. *Attention can be measured in terms of attributive clearness.*

Dallenbach found further, in both of his studies, that under the conditions of his experiments the reaction-time and the mean variation of this time offered reliable means for the measurement of attention. There was a positive correlation between attention introspectively estimated in terms of attributive clearness and the rate of reaction,⁷ and also between attention thus estimated and the mean variation of

¹ From the Psychological Laboratory of Cornell University.

² Külpe, O., *Outlines of Psychology*, (1892) 1895, 429.

³ Geissler, L. R., *Am. J. of Psy.*, XX, 1909, 473-529.

⁴ *Op. cit.*, 492.

⁵ *Op. cit.*, 502.

⁶ Dallenbach, K. M., *Am. J. of Psy.*, XXIV, 465-507; XXVII, 1916, 443-460.

⁷ *Op. cit.*, XXIV, 483-485; 501-502; XXVII, 453-455.

the reaction-time.⁸ His observers, however, were not under the *Aufgabe* of reaction; they did not even know that their reactions were being timed; and he was therefore cautious in drawing his conclusions. "It is possible that a 'reaction' of this sort indexes attention, whereas a formal and set reaction, so understood by the reactor, is too complex a matter to serve as an index."⁹

In our recent work upon "The Effect of Auditory Distraction on the Sensory Reaction"¹⁰ we took advantage of the opportunity offered to test the relation of clearness to the length of the sensory reaction. One of the observers, D, who was trained in the introspection of clearness, gave, after every series of 10 reactions, an estimation of the clearness-values of the processes involved during that period.

Three kinds of distractors were used: a metronome, beating during a series of 10 reactions; a bell, ringing just before and during the separate reactions; and a tuning-fork, sounding continuously throughout the entire period of distraction experiments. During the employment of every distraction, 100 distraction-series, and 33, 20, and 40 control series respectively, were obtained. A series consisted of 10 reactions.

The averages of the averages of the series, and the averages of the mean variations of the series, have been tabulated for every method of distraction according to the clearness of the processes involved. These data appear in Table I.

TABLE I

Average Series Reaction, Average Series Mean Variation, and Number of Series for every Degree of Clearness, under every Mode of Distraction

Distractor		Clearness					
		100-90	90-80	80-70	70-60	60-50	50-40
Metronome	Average	198.6	205.6	208.2	199.4	171.9	219.0
	Mean var.	14.8	17.9	21.0	23.0	24.0	27.2
	No. Series	41	37	7	4	1	2
Bell	Average	201.3	216.9	221.2	226.5	233.4	
	Mean var.	19.3	21.5	22.0	25.8	35.1	
	No. Series	18	37	50	14	1	
Tuning-fork	Average	218.9	220.2	231.3			
	Mean var.	17.9	19.0	21.9			
	No. Series	72	65	3			

Opposite the word "Average" appears, for every level of clearness, the general average of the averages for the separate series; opposite "Mean var." appears the general average of the mean variations for every series; and opposite "No. Series" appears the number of series used for computation.

The number of series under the distraction of the metronome totals only 90, whereas, as we have shown above, 133 series were actually taken. The discrepancy is due to the fact that clearness-estimations were not given until the observer had become accustomed to method and report of the main experiment. It was not until 40 series had

⁸ *Op. cit.*, XXIV, 485; 501; XXVII, 455-456.

⁹ *Op. cit.*, XXIV, 485.

¹⁰ Cassel, E. E., and Dallenbach, K. M., *Am. J. of Psy.*, XXIX, 1918.

been taken that D included introspective evaluations of clearness in his reports.

Table I shows that the higher levels of clearness have the shortest reaction-time. There are but two cases in which a lower level gives a shorter average reaction than the next higher; and both of these should be (and were) excluded from the computation of the correlation, since they were the averages of too few series (4 and 1 respectively). In fact, all averages obtained from less than 7 series were excluded from the computation, though this procedure tended to lower the coefficients of correlation. Calculated by Pearson's familiar "product moments" method, the results are:

<i>Distractor</i>	<i>Correlation</i>	<i>P. E.</i>
Metronome	0.987	0.009
Bell	0.967	0.016
Tuning-fork	0.999	0.0006

The higher levels of clearness have also the smallest mean variation. In not a single instance is the average variation of the reactions of a higher level as large as that of a lower. The coefficients and probable errors of the correlations between degrees of clearness and degrees of precision (calculated as above) are:

<i>Distractor</i>	<i>Correlation</i>	<i>P. E.</i>
Metronome	0.961	0.005
Bell	0.913	0.012
Tuning-fork	0.984	0.002

These data show that the rate of a simple sensory reaction, and its degree of precision as expressed by the m.v., are both (under our conditions) reliable means of determining the degree of clearness. It therefore follows, since attention itself is measurable in terms of clearness, that these objective measurements also give us a reliable index of attention.

It may be urged, in objection, (1) that the observer's reports, inasmuch as they were delayed until after the completion of 10 reactions, partake more of the nature of vague impressions, of guesses, than of true introspective descriptions; and (2) that the figures, inasmuch as they are averages of averages, are artificial and not representative. To meet these objections, and further to check the method and results, the observer, during the last 5 days of the experiment,

TABLE II
Average Reaction-Time, Mean Variation, and Number of Cases for Different Levels of Clearness

<i>Distractor</i>		<i>Clearness</i>				
		95	90	85	80	75
<i>Metronome</i>	<i>Average</i>	214.08	219.87	231.45	241.37	246.00
	<i>m.v.</i>	16.1	18.4	20.0	24.7	.....
	<i>No. cases</i>	68	431	173	27	1

reported upon the clearness of his mental processes immediately after every reaction. 100 distraction-reactions and 40 control reactions were

made every day: 700 cases in all.¹¹ These were distributed according to the clearness of the auditory sensations from the sound-hammer. The averages, the mean variations, and the number of cases for the different levels of clearness are brought together in Table II.

The relation between level of clearness, rate of reaction, and mean variation is remarkably constant. The coefficients of correlation (as figured by Pearson's method) are:

<i>Correlation of Clearness with</i>	<i>P. E.</i>	
Average Reaction.....	0.992	0.003
Mean Variation.....	0.972	0.013

These results corroborate those of the rougher determinations. Since they were obtained from a single observer, who was highly practised both in reaction and in introspection of clearness, we have no right to generalise them. The correlation is, however, so high and so constant, and persists through such marked shifts of attitude,¹² that we may conclude at any rate that, under these conditions of training, attributive clearness may be measured by the average duration and mean variation of the simple sensory reaction.

¹¹ D gave in all 1050 introspective reports of clearness. It is certain that he belongs to the dual level type; all of his reports without exception showed a clear focus and a vague background which varied reciprocally.

¹² In the study of which this is a corollary we found that D's attitude changed frequently during the course of the experiment, and also that the reaction-time varied with attitude. The present experiment shows that reaction-time is closely correlated with clearness. It would therefore appear that clearness and attitude are interrelated: as, indeed, is definitely indicated by the results of earlier experiments. We hope to return later to this general subject.

WHAT IS INTROSPECTION?

By STEPHEN C. PEPPER, Instructor in Psychology, Wellesley College

Several influences have contributed to make a wide gap between objective method and introspection. The connotation of the terms themselves has widened the gap, one suggesting externality, the other internality. The gap has also been widened by the association of one of the terms with the natural sciences or the study of matter, of the other with psychology or the study of mind, so that the time-worn contrast of matter and mind spreads to the methods by which each is supposed to be studied. But most of all the gap has been widened by the working hypothesis of parallelism. Parallelism is only a working hypothesis. Once a year at least every psychologist delivers a lecture pointing out that fact. Yet the more the psychologist asserts that parallelism is but a working hypothesis, the more he believes in his heart that it is fundamental truth. The hypothesis has operated like a hypnotic spell to separate introspection from objective method.

The Greeks did not have that distinction. One looks in vain through Plato for what appears so clear to us. There is a distinction there between knowledge and opinion, but that is not our distinction. We sometimes meet a vulgar layman today who is slow to understand what the difference is between introspection and objective observation. We have set these blindnesses down to ignorance. But what if we be seeing double!

It is not my opinion that we are positively seeing double. There are two objects. Objective method and introspection are different, but not incomparably different. They are two extremes of a single scale. The difference between them is merely one of degree. The reason this distinction was not observed by Plato is that the natural sciences had not progressed far enough in his day to bring to maturity what we now know as objective method. The only method Plato knew was introspection. And since he knew only one method, obviously he could not observe a distinction of methods. The distinction between introspection and objective method did not become prominent until after the natural sciences had made considerable progress. In Descartes we see the beginning of the distinction. In Berkeley and Locke we see it definitive. But those were the times following the prodigious growth of physics and astronomy under Galileo, Copernicus, and Newton. In the hands of these scientists the objective method developed out of introspection. And the philosophers who followed these scientists registered and defined the distinction. The old method, therefore, is introspection. Objective method is a new discovery. To it largely we owe the astonishing advances in science during the last three centuries.

The point I wish to emphasize in this article is the absence of any qualitative difference between objective method and introspection. As a means of approaching the subject, I shall take an analysis of introspection furnished by Titchener in a series of articles which appeared

in the *American Journal of Psychology* in 1912.¹ From a criticism of this analysis and the addition of a few further remarks, the point I have in mind I think will make itself evident.

There are three parts, says Titchener, in scientific introspection,—a process, an apperception, and a description. According to the temporal arrangement of these parts,—i. e., according to the way memory enters into the introspection,—three arrangements of these parts are possible. Thus there are three kinds of introspection:

1. In the first kind, "process and apperception occur together. Description is made on the basis of present immediacy.
2. In the second, "process and apperception occur together. Description is made on the basis of remembered apperception."
3. In the third, "process is recalled as memory-image. Apperception is of memory-image and description is on the basis of this apperception."²

Allowing *p* to stand for process, *a* for apperception, and *d* for description; a prime (') over any one of these letters to stand for the recollection of the part designated by that letter; and a parenthesis to stand for a single span of consciousness; we may express the three kinds of introspection graphically as follows:

1. (*pad*) — ()
2. (*pa*) — (*a'd*)
3. (*p*) — (*p'ad*)

The meaning Titchener attaches to process, apperception, and description may be gathered from the following paragraph:

"The essential thing in every case of introspection . . . is that some conscious process or part process, some state of consciousness or complex of states of consciousness, is made the object of a 'conscious psychological apperception.' This apperception is an appraisement, a judgment, a 'placing' from the psychological standpoint, of the state or process which is to be observed. It may be explicit, consisting of a 'properly formulated sentence in internal speech,' to which may even be added an inner comment such as 'important!' or 'don't forget!' Or again it may be sketchy and fleeting and make but little claim upon consciousness,—consisting perhaps of a bare suggestion, of verbal glosses, visual ideas, and so forth. The method is completed by a description which gives the apperception or appraisement 'a linguistic expression in accordance with instructions'."³

For the time being we shall make no comments on the "process" *p*.

Let us see, however, if we are quite sure what Titchener means by "apperception" *a*. It is a term with a very dangerous connotation, suggesting too prominently awareness. Now, there is a pretty wide agreement among psychologists at the present day that awareness is not to be found in introspection. There has even been a disposition in a certain recent philosophical school to deny the existence of awareness altogether. But whether there be awareness or not, it is assuredly not an object of consciousness. If there be awareness, it must be a thing inferred, for nobody was ever aware of awareness.

¹ E. B. Titchener, *Prolegomena to a Study of Introspection*, *Am. Journ. Psych.*, XXIII., 1912, 427-448; The Schema of Introspection, *Am. Journ. Psych.*, XXIII., 1912, 485-500.

² The Schema of Introspection, p. 491.

³ *op. cit.*, p. 491.

It would, therefore be impossible to remember awareness. If, then, Titchener intends "apperception" to be in any respect equivalent to awareness, it becomes immediately impossible that "apperception" should be recalled,—a fact that would strike out as invalid the second type of introspection. Also it is very difficult to see how an "apperception" could constitute a link between a process and a description if "apperception" is made equivalent to awareness and therefore is not to be thought of as an object of consciousness. On this score, all three kinds of introspection would become invalid, provided my symbolism were retained,—a symbolism which indicates a temporal sequence of the three parts of introspection.

But of course the symbolism is mine and not Titchener's, and it may not fully inclose his meaning. Indeed, I do not think it does, for Titchener's meaning seems to be ambiguous, and it is impossible to express an ambiguous statement in a single formula. In the opening sentence of the passage quoted above, Titchener speaks of a process that "is made the object of 'a conscious psychological apperception'." Obviously, if a process is the object of an "apperception," the "apperception" must be coincident with the process. At once my symbolism breaks down. But in the next sentence Titchener says that this "apperception" is "an appraisement, a judging, a 'placing'" which consists of a "properly formulated sentence in internal speech" or "of bare suggestion, of verbal glosses, visual ideas, and so forth." This meaning of "apperception" is something very different. It is description or suggested description and cannot be contemporary with the process but must be subsequent. And for this meaning of "apperception" my symbolism is perfectly correct.

Which of these meanings shall we accept? Is "apperception" to be regarded as awareness or as description? It cannot be awareness. Titchener's analysis is supposed to be an introspective analysis of introspection. But as we saw, one cannot introspect on awareness, and no one is more insistent on that point than Titchener himself.⁴ It must be description, then, that Titchener means by apperception.

But now the question arises, how shall we distinguish the description that is identified with apperception from the description which Titchener puts down as the third part of the act of introspection?

The only distinction it seems possible to make is that between a partial and a complete description. In order that an introspection should be of any value to a psychologist, he must be able to compare it with other introspections. But the only way to compare introspections is to compare descriptions of them. Descriptions of introspections, however, cannot be compared unless the words used in the descriptions agree specifically in their denotations. "Cold" must mean a particular sensory experience in every psychological introspection, otherwise there is no telling what the description describes. If one subject means by "cold" what another subject means by "cool," absolutely contradictory descriptions may result. Accordingly there has developed a more or less standardized psychological vocabulary, and a description is not complete until it has been stated in terms of that standard vocabulary.⁵ It is description in such terms, I take it, that

⁴ E. B. Titchener, *Text-book of Psychology*, 1913, 17-18.

⁵ Cf. E. G. Boring, Introspection in Dementia Precox, *Am. Jour. Psych.*, XXIV., 1913, 145ff., for a detailed account of the nature of a "complete description," and methods used to obtain it. Cf. also Titchener, Description vs. Statement of Meaning, *Am. Jour. Psych.*, XXIV., 1912, 165-182.

Titchener means by description as the third part of the introspective operation. For "a linguistic expression in accordance with instructions" would obviously be in terms of the standard psychological vocabulary if the person who gave the instructions were a psychologist. A description in terms of the standard psychological vocabulary is therefore a complete description, and any other description is only partial.

The function of the partial description is to act as a bridge between the process and the complete description when the complete description does not immediately follow the process. The subject translates a partial description which he recalls into the standard vocabulary, and the result is a complete description. Where a complete description is made directly from the process, no partial description enters in; or in other words, whenever there is a partial description, memory has been employed,—a fact which illustrates again how Titchener was confused by his "apperception." For in the first type of introspection,—viz., (pad) — () —memory was not supposed to enter at all: the description was supposed to be "made on the basis of present immediacy"; yet he inserts an "apperception" in the operation. Obviously all immediacy would be dissolved by that insertion. The same confusion is seen again in the second span of the third type of introspection.

Bearing these numerous criticisms in mind, we can now reformulate Titchener's three types of introspection, and present them in the following shape (I shall let a bracketed d stand for partial description):

1. (pd) — ()
2. ($p[d]$) — ($[d]'d$)
3. (p) — ($p'd$)

An examination of these three types of introspection shows that the first type is the model type,—viz., (pd). What is desired is a complete description of a process. Each type begins with a process and ends with a complete description of the process. The intermediaries,—recalled processes and partial descriptions,—are incidental and are lost sight of as soon as the introspection is over; their part in the operation is simply to carry one from the process to the complete description, when the complete description does not immediately follow the process. Process and complete description are the only two essential elements in any type of introspection. Hence (pd) is the model of introspection.

Now, what is the peculiar character of (pd) which makes introspection so different from observation in the objective sciences? It certainly does not reside in the description, d . Every scientist must conclude his observations by a complete description of exactly the same nature as the complete introspective description, a description in terms of the standardized scientific vocabulary in which every word has a strict and specific denotation. It is the same in this respect with physicist, chemist, or biologist as with psychologist. It is not therefore the description that gives introspection its unique quality. It must, then, be the process. In other words, introspection must differ from objective observation only in the kind of data studied.

Some psychologists enlarge at great length on the absolute contrast discoverable between objective and introspective data, and write out a long list of opposed characteristics. But on the whole the list may be reduced to three. First, objective data are spatial; introspective data are not spatial. Secondly, objective data are measurable; introspective data are not measurable. Thirdly, objective data are indirectly known through the mediation of the senses; introspective data are immediately known.

This is a formidable list of opposites and a most plausible one, but it cannot stand the lightest touch of analysis. Introspective data are not spatial, it is said, yet extent is an attribute of all visual sensations. Introspective data are not measurable, it is said, yet we introspect on the relative intensities of sensations, on the relative sizes of visual sensations, etc. Introspective data alone are immediately known, it is said; other data are known through the mediation of the senses. There is a curious misconception here, as though a physicist's, a chemist's, or a biologist's sensations were not just as good as a psychologist's. What the psychologists have in mind is the objective scientist's construction of a universe of objects and organisms with the accompanying theory that sensations are due to certain modifications occurring within the organisms. But the data for constructing this universe of objects and nervous organisms are sensations, the identical sensations which the psychologist himself has. Surely the visual sensations of a physicist are no different from the visual sensations of a psychologist, even though the physicist uses his sensations to discover the number of ether waves in a certain color, while the psychologist uses his for some other purpose. The physicist's sensation, blue, which becomes a datum of physics, is no different from the psychologist's sensation, blue, which becomes a datum of psychology.

What, then, is the difference between introspective and objective data? It is not that introspective data necessarily lack the spatial attribute, or are not measurable, or are immediate as contrasted with objective data which are mediate. All of these supposed differences are fictitious. The real difference is simply this, that objective data are picked, whereas introspective data are anything that comes along. The rare data are not the introspective data, as generally imagined; any data are introspective. Anything seen, heard, felt, enjoyed, or in any way experienced is fair game for introspection. The rare data are the objective data.

But how is this? How can data be picked? Must not a science take what it can get? These questions cannot be answered here. I must simply repeat that the sciences which employ the objective method do pick their data. And it is just this fussiness which distinguishes the objective method from the introspective.

There is a regular law that can be traced through the objective sciences governing the choice of data. Starting with the whole mass of experience, we find that the objective sciences make their first selection against the interoceptive and proprioceptive experiences. Pullings, vertigos, hungers, pleasures, pains, fancies, and imaginings are not recognized data in any objective science. In other words, kinaesthetic and organic sensations, feelings, emotions, and cognitions are all ruled out of the sphere of objective method. The remaining types of experience are acceptable in the more undeveloped objective sciences,—i. e., visual, auditory, tactual, olfactory, and gustatory sensations are acceptable objective data. In a thoroughly developed objective science, however, nothing is acceptable but visual data. In short an objective method is one which limits its choice of data to experiences derived from the exteroceptive sense organs, and in refined objective method the data are further limited to experiences derived only from vision.⁶

⁶ For a more extended analysis of this selective process in the objective sciences cf. S. C. Pepper, *The Nature of Scientific Matter*, *Jour. of Phil., Psych., and Sc. Meth.*, 1917, XIV., 483-491.

Think of any important experiment in such refined objective sciences as physics, chemistry, or biology, and then list the data employed in determining its results. They will be found to be mainly, if not entirely, visual. Take, for example, the experiment for Boyle's Law. This is the law that at constant temperatures the product of the volume of a gas by the pressure exerted upon it is always the same. Now turning to our stock of senses and choosing those apparently best adapted to obtain the data needed in the experiment, we should say off-hand that the temperature would be in terms of our cold and warm sensations, that pressure would be in terms of our pressure sensations, and volume in terms of our articular sensations. But what do we find? Not one of these kinds of sensations is mentioned. Temperature is in terms of visual degrees marked off on a thermometer. Pressure is in terms of certain visual degrees marked off on a U-shaped tube partly filled with mercury. Volume is in terms of certain other visual degrees marked off on the same U-shaped tube. All the data are visual. And this case is typical.

To return, now, to the distinction between the introspective and the objective methods. We found that in their abstract form they are exactly similar. Both consist of a process and a scientific description of that process. The distinction between these two methods must, therefore, be a distinction either in the kind of process or in the kind of scientific description employed. We saw that so far as scientific description is concerned no difference could be discovered. One scientific description is exactly like another. The descriptions in physics are just like those in introspective psychology. The distinction between the objective and introspective methods must, therefore, reside in the process described. And that is exactly what we find.

The introspective method will accept any kind of experiences whatsoever as fit material for its process, as fit data to be described. The objective method will accept only sensations derived from the exteroceptive sense organs, and prefers to accept only sensations derived from vision. Introspective method is democratic and recognizes no innate fitness of data. Objective method is aristocratic and insists on the natural superiority of vision. Herein lies the whole distinction between the introspective and the objective methods. They both have the form (*pd*). The difference between them is that in introspection *p* = any experience whatsoever; while in objective method *p* = sensations derived from the exteroceptive sense organs and ultimately sensations derived only from vision.

A BIBLIOGRAPHY OF *RHYTHM*
(Second Supplementary List)

By CHRISTIAN A. RUCKMICH

To the best of the compiler's present knowledge and endeavor, this list of 115 titles supplements and continues to date the original list of 344 titles¹ and the first supplementary list of 66 titles.² Since the European and especially the Germanic literature has become more inaccessible, it is impossible to vouch for the comprehensiveness or adequacy of the compilation. But with the aid of those who are interested in the subject and who in various ways have shared in the addition of titles previously omitted and of new titles worthy of recognition, the writer feels that the bibliography now fairly represents all important contributions to the general field of *rhythm*. He acknowledges indebtedness and expresses his gratitude to those who have contributed suggestions and cordially invites further criticism and aid.

As the bibliography grows in extent it is increasingly difficult to draw the line between discussions of *rhythm* proper and the various implications and applications of rhythmical phenomena in related fields of investigation. It is not at all times easy to differentiate for our purposes between studies of rhythmical phenomena made from the subjective standpoint for the sake of determining the nature of the perception of rhythm itself and studies which emphasize the objective conditions of rhythmical sequences with little or no regard for the ultimate *quale* of the rhythmical consciousness. Often the distinction is not clearly drawn in any one investigation. Many studies made in other sciences are, of course, primarily aimed at results other than those that involve mental effects. It were therefore more truthful to say that, with probable crowding at certain points, all of the titles recorded can be arranged in a linear series. At the one extreme are the investigations in which an attempt is made to discover the mental correlates of rhythmical phenomena; at the other extreme are the investigations which aim to determine the physical basis for rhythmical occurrences.

It appears further that workers in the general field of rhythm from any angle are often eager to draw material from other sources and that there is much collaboration between students in neighboring domains. For these several reasons it has seemed wisest to include in this bibliography all published studies which contribute original discussions to the general field in any of its aspects. Owing to the correlation of the various phases of the subject with one another, it will hardly be necessary to justify this policy. Consequently the bibliography refers to discussions of rhythmical phenomena in the fields of psychology, of music, of pictorial and sculptural art, of prosody, of pedagogy, of aesthetic dancing, of physiology, of biology, of geo-

¹ This JOURNAL, 24, 1913, 508-19.

² This JOURNAL, 26, 1915, 457-9.

logy, of physics, and of chemistry. Naturally the list is most nearly complete in the psychological field.

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MINOR STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF CORNELL UNIVERSITY

Communicated by E. B. TITCHENER and E. G. BORING

XL. ON THE CALCULATION OF AN ASSOCIATIVE LIMEN

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Fundamentally the problem of the 'measurement of memory' is a counterpart of the problem of the measurement of sensation. In the one we seek a correlation between the 'strength' of an 'association' and the magnitude of some one of its conditions (*e.g.*, number of repetitions); in the other we wish to correlate a series of sensory impressions with a series of stimuli. In the psychophysics of sensation we may turn, in the first place, to the notion of a threshold. We can not, on the side of sensation, say how much more than adequately determined a present sensation or sense-difference is, or how much less than adequately determined an absent sensation or sense-difference is. We can state with assurance only that the sensation or sense-difference is or is not present. But if there were a stimulus just barely adequate to a given sensation or sense-difference, could determine it and call it a "threshold." As a matter of fact, however, no sense-organ remains constantly disposed for stimulation. Hence we are forced to substitute for the crude notion of the threshold that of the statistical limen, which is the stimulus-value that is just as often adequate as inadequate to the given sensation or sense-difference.¹ In like manner, in the measurement of memory we can not tell, when a given association is realized, how much more than adequate to reproduction it is, or, when it is not realized, how much it lacks of being adequate; but we can tell whether or not the association is realized. The determination of a threshold for memory appears to be the obvious 'way out;' but there are no fixed conditions that are always just adequate to reproduction, for the nervous system is ever varyingly disposed for memorial impression and reproduction, just as it is for sensory impression. Given a certain number of repetitions, let us say, then some associations are realized and others not. In such a case the proper measure seems to be the memorial limen, *i.e.*, the number of repetitions (or other measure) that produces just as many 'right associates' as not.²

¹ Cf. E. G. Boring, A Chart of the Psychometric Function, this JOURNAL, 28, 1917, 465; esp. p. 469 (note) and p. 470.

² The analogy between the problems of memory and those of the psychophysics of sensation is implicit in discussions of the memory-methods; cf. H. Ebbinghaus, *Memory*, 1913 (1885), Chap. II. Here and elsewhere the concept of the threshold is implied, although it is not explicitly formulated. A. Jost, *Zeitschr. f. Psychol.*, 14, 1897, 436ff., esp. 455-459, bases his discussion of right associates upon the notion of a *Treffergrenze*. So far as we are aware, no one, however, has attempted seriously to employ the thorough-going procedures of psychophysics to the problem of memory.

If we are to determine an associative limen we must use a method of partial mastery. Complete mastery would mean that every association was more than critically adequate to reproduction, and that we could not therefore interpolate the limen, the point of most frequent critical adequacy.³ A 'constant method' (*Konstanzmethode*), utilizing the procedure of the method of constant stimuli, is, at the present time, the natural one to adopt. We may determine for different numbers of repetitions (say) the percentages of right associates, plot these percentages as a psychometric (mnemometric) function, and interpolate, as the limen, the point where the frequency of reproduction should be 50%. The *Treffermethode* lends itself readily to such treatment, although other methods of partial mastery, such as the methods of retained members and of prompting, can also be dealt with in this manner.

In adopting the 'constant method' we have still to decide what hypothesis of the psychometric function we shall use. Undoubtedly in an untried field an indifferent hypothesis⁴ is ordinarily safest. The inexact results of memory experiments, however, make it desirable that the gross variations of the psychometric functions be smoothed off, under the principle of least squares, in accordance with some definite assumption. The *phi-gamma* hypothesis recommends itself for two reasons. In the first place, since it summarizes satisfactorily the psychophysical relationship in many cases of sensation, it is reasonable that we should tentatively attempt its extension to other psychophysical problems. In the second place, it is *a priori* the proper psychometric function, provided that the variations of nervous disposition are chance variations, and provided we are sure that our unit of measurement on the physical side is not merely a physical unit but actually a unit of *stimulus* or of some other condition of nervous impression.⁵ We have adopted the *phi-gamma* hypothesis, thus tentatively, in this study.

Whether the 'mnemometric function' be the *phi-gamma* function or not, it seems obvious that it must have, in general, the same properties; that is to say, it must approach zero and unity gradually, and have its maximal slope at an intermediate point. From such a premise important conclusions affecting the value of the memory-methods follow. If the 'mnemometric function' is asymptotic to the 100%-line, complete mastery must be infinitely improbable. In any case, complete mastery, when seemingly achieved, is presumably due to the fewness of the cases, and its measure is exceedingly unreliable. Theoretically the weight, *P*, would be 0. On the other hand, half-mastery must have relatively great, perhaps maximal, reliability. Hence it follows in general (a) that a measure of complete mastery is less reliable than a measure of partial mastery, and that this difference works to the disadvantage of the method of complete mastery; (b) that percentages near 50% are probably more reliable in a method of partial mastery than percentages remote from 50%; and (c) that

³ See foot-note 1.

⁴ See, for example, F. M. Urban, *Psychol. Rev.*, 17, 1910, 232ff; *Arch. f. d. ges. Psychol.*, 15, 1909, 335ff.

⁵ Boring, *op. cit.*, the whole discussion, but esp. p. 469. The assumption of Boring's paper is that the centimeter is a true unit of stimulus; that every centimeter disposes by an equal amount toward the impression 'two;' that 0.8 cm., for example, is twice as effective as 0.4, and 1.6 twice as effective as 0.8.

percentage-differences in one part of the percentile scale (*e.g.*, 90% to 95%) are presumably not equivalent, in a method of partial mastery, to percentage-differences in another part of the percentile scale (*e.g.*, 55% to 60%), and that the two can not therefore be compared. Measures of reliability and comparisons of percentage-differences become possible as soon as a definite hypothesis has been fixed upon, as, for example, the *phi-gamma* hypothesis.

We have laid down a theoretical programme for the investigation of memory. As a rough preliminary test, we have undertaken the determination of two associative limens, using the experimental procedure of the method of right associates and the statistical treatment of the method of constant stimuli.

We had two observers, Miss M. Kincaid (*K*) and Mrs. H. D. Williams (*W*), both with a little previous experience in memory experiments. *K* is an ingenious learner; we had, after preliminary trials, to give her additional instructions, in the effort to prevent her from making punning associations upon the nonsense syllables. She never however, acquired the ability to maintain a constant disinterested attitude toward the series.

We used throughout series of ten nonsense syllables. We had in every series five short and five long vowels (a, e, i, o, u), indicating the long vowel by a diacritical mark. In all other respects we followed Gamble's modification of Müller and Schumann's rules.⁶ The order of syllables in the test series was always different from the order in the presentation and different in different tests.

We adopted number of repetitions as a measure of associative strength. Each observer learned 50 ten-syllable series. At the first session five series were presented, every one with a different number of repetitions; at the second session five more series, with the same numbers of repetitions, and so on. There were ten such sessions in all. The order in which the five different numbers of repetitions were given was changed at every session, so that every number of repetitions came equally often (twice) at every place during the session (*i.e.*, twice in first, in second, in third, in fourth, and in last place; ten times in all in the ten sessions; once in every session).

The observers were practised for two weeks before the beginning of the regular series. The ten sessions came at the same hour of the day for each observer, five sessions on five consecutive days of one week, and five sessions on five days of the next week. The work was performed in the Cornell Summer Session, 1917.

The syllables were typewritten, and presented stepwise on the Spindler and Hoyer memory-apparatus at the rate of one syllable in 0.75 sec. The test-series for reproduction was presented 15 sec. after the conclusion of the learning-series. Within a single session every series was begun 10 min. after the beginning of the preceding series. There was thus an interval between successive series of about 5 min.

The general instruction was as follows: "After the signals 'ready,' 'now,' there will be presented to you successively a series of nonsense syllables. This series will be on the revolving drum of the machine and you will see one syllable at a time. You are to fixate the left-hand portion of the window and pronounce the syllables in trochaic rhythm as they appear. Give full and equal attention to every syllable. After a number of repetitions the window will be closed at the left

⁶ E. A. McC. Gamble, *Psychol. Rev. Monog.*, No. 43, 1909, 18ff.

and the first members of the pairs will be presented at the right. Then after the signal, 'now,' you are to fixate the right-hand portion of the window, and when the syllable appears pronounce as quickly as possible the syllable which followed it in the series. After you have pronounced it write it down. If you do not know the syllable which followed it, say, 'Don't know,' and put a dash on your paper."

When the experiment was completed we had presented fifty pairs of syllables for every one of five different numbers of repetitions. We scored the associates as right or half-right, and came out with even (non-fractional) percentages of right associates for every number of repetitions. The numbers of repetitions used for each observer were so determined in the preliminary experiments as to give percentages on either side of 50%. The actual numbers of repetitions used (r) and the resulting percentages of right associates (p) are as follows:

$$\text{For } K: \begin{array}{rccccc} r & = & 1 & 2 & 3 & 4 & 5 \\ p & = & .36 & .45 & .72 & .69 & .66 \end{array}$$

$$\text{For } W: \begin{array}{rccccc} r & = & 2 & 5 & 8 & 11 & 14 \\ p & = & .37 & .59 & .84 & .83 & .88 \end{array}$$

From these data we computed with the aid of Urban's tables (since we had arranged our procedure to give the even percentages which the tables require), the associative limens:

$$\begin{array}{ll} \text{For } K: h = .1534, & L = 2.1029 \text{ repetitions.} \\ \text{For } W: h = .0920, & L = 3.4244 \text{ repetitions.} \end{array}$$

Considered in relation to the *phi-gamma* hypothesis, the data are manifestly unsatisfactory. Both sets show the last three percentages grouped closely together, both sets show inversions, and K 's maximum occurs for the middle number of repetitions. We can tell how closely the hypothesis is approximated if we take the sums of the squares of the deviations of the theoretical percentages (the most probable values under the hypothesis) from the actual percentages,⁷ $\sum d^2$. The magnitude of this measure is dependent, however, upon the number of observation-equations; we get an independent value if we divide $\sum d^2$ by the excess of the number of observation-equations ($M, = 5$ in these two experiments) over the number of normal equations ($\mu, = 2$ for the *phi-gamma* hypothesis). If we take the square root of this quotient, we get for different cases values that are directly comparable one with another (since they are *per cents*) and that involve few digits. The resulting measure of approximation to the hypothesis we may call⁸

$$\epsilon = \sqrt{\frac{\sum d^2}{M - \mu}}$$

By computation⁹ we get

$$\begin{array}{ll} \text{For } K: \epsilon = .101 \\ \text{For } W: \epsilon = .078 \end{array}$$

The maximal individual value that Urban found for the *phi-gamma*

⁷ Cf. Urban, *Psychol. Rev.*, 17, 258.

⁸ Cf. W. W. Johnson, *Theory of Errors and Methods of Least Squares*, 1915, 108f.

⁹ See Boring, this JOURNAL, 28, 1917, 284, 288, 291f.

hypothesis with lifted weights is $\epsilon = .053$; his maximal average value is $\epsilon = .044$; his minimal average value is $\epsilon = .031$; his minimal individual value is $\epsilon = .012$.¹⁰ It appears then that our results do not satisfy the *phi-gamma* hypothesis nearly so satisfactorily as do Urban's results with lifted weights.

This state of affairs does not necessarily mean that the *phi-gamma* hypothesis is incorrect. It would come about if successive repetitions became progressively less effective for association (as they do for retention). In such a case, however, the repetition could not be taken as a unit of associative strength; we should have to determine what function of the number of repetitions the effective associative condition ('associative unit') is, just as in the psychophysics of sensation we must know what function of the physical unit of our stimulating instrument the effective value of stimulus is.¹¹

We can not turn to the literature for the form of this function. The method of complete mastery gives it for retention,¹² but it can not give it for learning, since this method assumes the repetition as its unit. No method of partial mastery¹³ can give it, because every such method uses a *percent* of complete mastery as a unit, and equal percentile ranges can not represent equal differences of the effective condition of association on any other assumption than the very improbable one that the "mnemometric" function is a straight line.

Let us call the measure of the effective condition of association, a , then $a = f(r)$, but the f -function is unknown. We began by assuming $a = r$, and found that we did not approximate the *phi-gamma* function closely. We can not from our data determine the natures of both this f -function and of the "mnemometric" function; but we may assume either one and study the other.

Suppose now that, in addition to our original assumption, $a = r$, we assume tentatively that $a = \log r$, that $a = \sqrt{r}$, and that $a = \sqrt[3]{r}$.¹⁴ All three functions give progressively smaller increments of a for every additional r . The square root function is less eccentric than

¹⁰Computed from *Psychol. Rev.*, 17, 258.

¹¹E.g., in using Fechner's sound pendulum, the unit of the instrument is the degree, and the angle, θ , is measured in degrees; but successive degrees do not represent equal increments of auditory stimulus; the unit of stimulus is $\sin^2 \frac{1}{2}\theta$. In the same manner we may find that the effective condition of association (associative "stimulus") is some other function of the number of repetitions than a direct proportion. Cf. foot-note 5 above.

¹²Ebbinghaus, *op. cit.*, 52-61.

¹³W. G. Smith, *Psychol. Rev.*, 3, 1896, 21-31, gives such a function obtained by a method of retained members; E. Ephrussi, *Exper. Beiträge zur Lehre vom Gedächtnis*, 1904, 109-121, by the method of promptings; C. Knors, *Arch. f. d. ges. Psychol.*, 17, 1910, 297-361, by the *Treffermethode* and an *Aussagemethode*.

¹⁴It might be argued that the general logarithmic formula is not $a = \log r$, but $a = k \log r + b$, where k and b are constants. We may, however, let $k = 1$, if we do not care about the size of the associative unit in which a is measured; and we may let $b = 0$, if we do not care for what origin we measure a . Having determined our limen on these assumptions, we may alter *ex post facto* the size of the unit or the point of origin in accordance with any further consideration that may influence us.

The same argument applies to the other functions of r .

the logarithmic function, the cube root more so. We may use these values of a as abscissa-values, and compute h and the limen. We can not use Urban's tables, because our abscissa-values are no longer equidistant. We must multiply out. The limen and h come out in terms of the a -units, but the limen (not h) can be changed back into repetitions by taking the number whose logarithm it is, or by squaring it, or by cubing it, as the case may be. The results of these computations we give below. We add for W the case of $a = \sqrt[100]{r}$ to show that there is no great difference to be expected from taking higher powers.

	$\frac{a}{K} = r$	$\log r$	\sqrt{r}	$\sqrt[3]{r}$	$\sqrt[100]{r}$
Limen in reps.	2.103	1.862	1.994	1.948	.....
	W 3.424	3.169	3.363	3.261	3.040
ϵ in %.....	K .101	.082	.090	.087	....
	W .078	.050	.055	.051	.054

It is obvious that the limen depends upon the hypothesis that we assume. Apparently, if $a = \sqrt[x]{r}$, then the greater the value of x the lower the value of the limen. (The limen is maximal when $x=1$; minimal when $x=3$ for K or 100 for W .) For $x=\log r$, we get lower values of the limen than for the cube root. We might decide which function, and hence which limen, to accept, by determining which approximates the *phi-gamma* hypothesis most closely. The values of ϵ show these approximations. They show that the square root satisfies the *phi-gamma* hypothesis better than the direct equation, $a=r$; the cube root is even better; improvement does not necessarily go on indefinitely, for the 100th root in the case of W is worse again; and the logarithmic function is still better than any of the root-functions tried. If we take Urban's work with lifted weights as our standard, then all the values of ϵ for K are too high. K was presumably too ingenious and erratic to give the steady results presupposed under the *phi-gamma* hypothesis. The values of ϵ for W are, however, comparable with Urban's. Two of them are less than his maximal value, .053. It appears, therefore, that, given the proper function that a is of r , together with consistent observation, we have reason to expect that the *phi-gamma* hypothesis will serve as a basis for the computation of memory-limens with a degree of reliability not very much less than the reliability with which the same hypothesis serves in the psychophysics of sensation.

We have sought to support this tentative conclusion by cases drawn from the literature of memory. For this purpose we selected the two more consistent of Knors' three adult observers, A and B ; and we took for each of these observers the case where the *Treffermethode* was used with 10-syllable nonsense series. The cases are thus directly comparable with our own. In addition we took the average of Smith's results for a 10-syllable series obtained by a method of retained members, and Ephrussi's results for a 10-syllable series with Ebbinghaus as observer by the method of promptings.¹⁵ Since the root

¹⁵Knors, *op. cit.*, 319; Smith, *op. cit.*, 26; Ephrussi, *op. cit.*, 111.

functions did not differ greatly with respect to ε from the logarithmic function in the preceding trials, we made these additional calculations merely for $a=r$ and $a=\log r$. The values of the limens and of ε for these new cases and for our own observers, K and W , are tabulated herewith.

	No. of observa- tions	Limens in reps.		ε in %	
		r	$\log r$	r	$\log r$
K	5	2.103	1.862	.101	.082
W	5	3.424	3.169	.078	.050
Knors- A	6	1.880	1.626	.105	.089
Knors- B	5	1.602	1.468	.056	.005
Ephrussi-Ebbinghaus.....	9	2.509	2.070	.072	.084
Smith (av.).....	5	3.379	2.624	.064	.022

The table substantiates our former conclusions. The logarithmic formula gives always the lower limen and, with the exception of the Ephrussi-Ebbinghaus case, the closer approximation to the *phi-gamma* hypothesis. In Smith's average case, ε is less than Urban's minimal average (.031). Knors' observer B approximates the *phi-gamma* hypothesis more closely than any individual case of Urban's (Urban's minimal ε is .012.)

The two hypotheses, *vis.*, that the "mnemometric" function is the *phi-gamma* function and that effectiveness for associative impression varies with the logarithm of the number of repetitions, work so well together that one tends naturally to jump to the conclusion that each has proved the other. And if we take certain extraneous facts into account, this conclusion is not necessarily the bad logic it would seem to be. We know, on the one hand, that the *phi-gamma* hypothesis does summarize certain facts of the nervous system which hold in the sphere of sensation, and that its properties reflect the property of chance dispositional variation which we have good reasons to believe is characteristic of nervous tissue. We have indirect indications, on the other hand, although no direct proof, that successive repetitions are progressively less effective for learning. Jost's law, for example, in its simplest interpretation suggests some such fact. If we can prove neither hypothesis alone, but if there are nevertheless initial presumptions in favor of each separately, and if in conjunction the two hypotheses constitute jointly an approximate summary of observed data, then each hypothesis gains support from the other; and, at any rate, the two together may be regarded as a single hypothesis adequate to the facts, until new data are discovered which will not conform with the compound assumption.

Unfortunately for theory, we have as yet very few data that bear upon the problem. Data obtained under an inconstant attitude, like K 's, are scarcely admissible. If we accept such published results as there are upon their face value, then we do not always find that the logarithmic assumption, in conjunction with the *phi-gamma* hypothesis, is borne out. In general, so far as our analysis of the cases has gone, $a=\log r$ seems to give a smaller ε than $a=r$. We have seen that the Ephrussi-Ebbinghaus case is an exception; and we can find other exceptions. For example, in the 18-syllable series with Knors' observer B , $A=\log r$ is a better assumption than $a=r$, but $a=\sqrt{r}$ is better still. In the 18-syllable series with Knors' observer A , $a=r$ is an almost perfect hypothesis, much better than any other

that we tried.¹⁶ Obviously a thorough-going study of compound hypotheses is needed. Such a study must, moreover, be made presumably upon data that are taken under more careful conditions of attitudinal control of the observer than are found in the ordinary memory experiment.

We conclude: that the problem of the 'measurement of memory,' like other psychophysical problems, can be solved most reliably and in terms that admit of the widest comparison by the determination of an associative limen; that a constant method, like the method of constant stimuli, is applicable; that such a method involves the determination of a mnemometric function, comparable with the psychometric function for sensation, and that there is reason to believe that the *phi*-function of *gamma* may prove to be as satisfactory an hypothesis in the field of memory as it has proved to be in the field of sensation; that the determination of the associative limen depends further, however, upon the use of some proper measure of the effective condition of association; that the repetition is probably not such a measure, and that the function that this measure is of the number of repetitions of a given material must constitute a second assumption of the method, at least in so far as it can not be determined independently; and finally that the two-fold assumption—that the mnemometric function is the *phi*-function of *gamma* and that the effective condition of association varies with the logarithm of the number of repetitions—appears to be in approximate accordance with the facts, although the experimental data are insufficiently reliable and show some exceptions.

We wish to emphasize the tentative nature of this study; we have sought rather to indicate a method than to make a discovery. Our work, we think, should be done over again under the most constant attitudinal conditions obtainable in an observer. It should be paralleled further by a study in which length of series is the variable in terms of which the limen is to be stated. The method could then be extended to retention. Meanwhile a thorough-going working over of the results already in the literature, with an indifferent hypothesis as well as with the *phi*-function of *gamma*, might prove valuable.

¹⁶ There is a simpler way of dealing with hypotheses of the value of a than the one described: it lacks, however, the advantage of giving the values of ϵ used above. In a given case one plots against values of r the corresponding values of γ obtained from the p for every r . Under the *phi-gamma* hypothesis, γ must be a direct measure of a . Hence, if r is a direct measure of a , we get a straight line. If the curve as plotted does not approach a straight line, we can try plotting γ against $\log r$, \sqrt{r} , and so on, and select as the best hypothesis the nearest approach to a straight line. It is often easy to make a decision by inspection of the curves as actually plotted on graph paper. In a careful investigation the curves could be adjusted by the method of least squares, with every γ weighted by the corresponding P for the *phi-gamma* hypothesis.

XLI. AN ANALYSIS OF THE PSYCHOMETRIC FUNCTION FOR THE TWO-POINT LIMEN WITH RESPECT TO THE PARADOXICAL ERROR

By MARGARET KINCAID

We understand by the 'paradoxical error' a report of dual impression for a single-point stimulation on the skin. This 'illusion' has received attention from psychologists, and the reported experiments,¹ which have as their purpose a systematic account of the phenomenon, are evidence of its immediate impression occurrence, apart from the effects of attentional and attitudinal variations.² We are proposing a mathematical analysis of the psychometric function as it is actually given by a standardized method under constant conditions; i. e., we are accepting as our premise the fact of the paradoxical error and are making our problem the interpretation of this fact.

It can be seen that if the paradoxical error is strongly operative at zero separation of the aesthesiometer (a single point), the resulting psychometric function for the 'two' judgments may be hook-shaped. This fact is seen in Riecker's³ experimental data, where the hook-curve occurs frequently. The existence of these hook-curves suggested a problem: namely, the analysis of the psychometric function into two antagonistic dispositions. Thus, in this paper, we have assumed, in the first place, a disposition *A*, which is the tendency for increase in the frequency of the judgment 'two', and which, as such, is usually thought to be the sole condition, on the side of the stimulus, of the psychometric function. We have posited, further, a disposition *B*, which represents an antagonistic tendency for the frequency of the impression 'two' to increase with smaller separations; a function that in the limiting case of zero separation might account for the paradoxical error. In brief, we have supposed that the psychometric function is a resultant of two simultaneously operative and mutually antagonistic dispositions.

Our actual experimental problem was twofold: we desired to obtain (1) data which would show an obvious tendency toward the paradoxical error, and (2) data taken under the same conditions which appeared on immediate inspection to involve no such tendency. We had, further, corresponding analytical problems: (1) to test the possibility of a mathematical resolution of the hook-curve into two hypothetical

¹V. Henri, *Ueber die Raumwahrnehmung des Tastsinnes*, 1898, 61 ff.; V. Henri und G. Tawney, *Ueber die Trugwahrnehmung zweier Punkte bei der Berührung eines Punktes der Haut*, *Philos. Stud.*, 1895, 11, 394 ff.; G. A. Tawney, *Ueber die Wahrnehmung zweier Punkte mittelst des Tastsinnes, mit Rücksicht auf die Frage der Übung und die Entstehung der Vexirfehler*, *Philos. Stud.*, 1896-98, 13, 163 ff.

²Cf. E. B. Titchener, *Exp. Psych.*, I, ii., 1901, 381.

³A. Riecker, *Versuche über den Raumsinn der Kopfhaut*, *Z. f. Biol.*, 1874, 10, 177 ff. There are eight hook-curves in thirty cases.

dispositions, *A* and *B*, and (2) to apply the same mathematical treatment to our 'normal' curves (i.e. curves without hooks), in order that the effect of analysis in the two cases might be compared.

Preliminary experiments were performed upon all available observers, in order to identify those who would be able to give the two types of data required. The observers finally selected were Miss M. Cowdrick (*C*), an advanced undergraduate student in psychology, and Dr. E. G. Boring (*B*), instructor in the department. Dr. Boring is a practised observer in cutaneous perceptions, having participated in work upon the two-point limen in two previous experiments.⁴ The hook-curve which was our main objective was found for *B*'s arm, while *C*'s arm and *B*'s forehead yielded 'normal' curves.

The experimental work was carried on during the Summer Session of 1917. The stimuli were applied by a Griesbach aesthesiometer with the hard rubber points used by Boring in his nerve-section experiment. The area of stimulation was controlled by a line about 8 cm. long drawn longitudinally upon the volar side of the right arm; veins, tendons and other topographical features were as far as possible avoided.⁵ A similar area was employed on the forehead: a wrinkle dividing the surface approximately in half was used as the guiding line. The points were put down longitudinally with a constant pressure of 10 gr. in varying positions on or close to these lines.

The instructions given to *O* at the beginning of each session were as follows: "After the signal 'now', you will be given a cutaneous stimulus. Make an immediate judgment of 'one' or 'two.' The judgment 'two' is to stand for two discrete impressions; all other impressions are to be judged as 'one.' Make every judgment independently, without reference to any preceding impression. Keep as constant an attitude as possible; if for any reason your attitude changes, so that you are in doubt about a particular impression, ask to have it repeated."⁶ An immediate judgment was required: if the stimulus remained upon the skin for more than 3 or 4 sec. without a report from *O*, the points were removed and the stimulus was applied at a different place.

TABLE I

<i>D</i> =stimuli in mm.	<i>P</i> =% of '2' judgments					<i>h</i>	<i>L</i>
	2	8	14	20	26		
Case I. <i>B</i> —arm.	57	47	65	72	94	.0330	4.0316
Case II. <i>B</i> —forehead.	2	3	42	100	100	.1261	15.5114
Case III. <i>C</i> —arm.	1	2	10	52	93	.1692	20.3833

We used the method of constant stimuli: five stimuli separated by equal steps. The size of the step was determined in preliminary experiments on *B*'s arm. For purposes of comparison the same set

⁴ E. J. Gates, The Determination of the Limens of Single and Dual Impression by the Method of Constant Stimuli, this JOURNAL, 1915, 26, 152 ff.; E. G. Boring, Cutaneous Sensation after Nerve-Division, *Quart. Jour. Exp. Physiol.*, 1916, 10, 1 ff.

⁵ This area was symmetrical to the pathological area on *B*'s left arm, Boring, *op. cit.*, 6 f. For the aesthesiometer, see p. 22.

⁶ The same instructions were used with satisfactory results by L. B. Hoisington; this JOURNAL, 1917, 28, 588 ff.

of stimuli was used in the other cases. The separation of 2 mm. was as close to apposition of the aesthesiometer points as our instrument would permit. Five series of 100 stimulations each were used for the determination of a limen; one series as a rule was given on a single day.

The initial results appear in Table I. The obvious features are: (1) the inversion in case I; (2) the lack of inversions in cases II and III; (3) the high percentage of 'two' judgments with narrow separations in case I; (4) the close approach to 0% and 100% of 'two' judgments at either end of the series in cases II and III.

By inspection, cases II and III might be expected to approximate the $\Phi(\gamma)$ -hypothesis, and we may compute the h (measure of precision) and L (limen) for them. If we also compute these values for case I, we see that L is a very much smaller quantity; it is quite conceivable that, if the values of p were high enough, we might even have a negative limen as our result.

With these data, therefore, as an experimental background we are ready to begin our mathematical analysis. We must first, however, call attention to the fact that we might expect in these cases to get a close approximation to the $\Phi(\gamma)$ -hypothesis for two reasons: (1) because it applies in other sense departments;⁷ and (2) because such approximations are observed in many 'normal' cases.⁸ If then in the nomenclature of our original analysis of the hook-curve we assume disposition A to be the $\Phi(\gamma)$, we are able to compute the B -function in accordance with the following logical argument. (1) We may expect the B -function to be least for our widest separations. (2) Assuming that the B -function may be neglected for the last two D 's (separations), let us suppose that these frequencies determine a $\Phi(\gamma)$ which is the A -function. (Even if the B -function has not become negligible for the last two D 's, we may still hope to get comparative results from this procedure; i. e. we may at least determine how much *more* the 'two' tendency of the B -function is for the first three D 's although the absolute amount may be actually underestimated.) (3) The values of the B -function which we determine for the first three D 's are the amount that the psychometric function departs from the $\Phi(\gamma)$ assumed for the last two D 's. A word of

TABLE II

1	2	3	4	5	6	7	8	9	10	11
D	p	x	γ	γ_c ($d=1.009$)	p_c	$\text{Cor-}\gamma$ ($\gamma-\gamma_c$)	$\text{Cor-}x$	$\frac{xc}{x+\text{cor-}x}$	$\frac{\text{Cor-}D}{6 \text{ Cor-}\gamma}$	$\frac{Dc}{D+\text{cor-}D}$
2	.01	-2	-1.645	-2.992	.000	1.347	1.33	-.67	11.76	13.76
8	.02	-1	-1.452	-1.983	.003	.531	.52	-.48	4.63	12.63
14	.10	0	-.906	-.974	.168	.068	.06	.06	.59	14.59
20	.52	1	.035	.035	.520	0	0	1.00	0	20
26	.93	2	1.044	1.044	.930	0	0	2.00	0	26

⁷ Cf. F. M. Urban, The Method of Constant Stimuli and Its Generalizations, *Psychol. Rev.*, 1910, 17, 257 ff.; Ein Beitrag zur Kenntnis der psychometrischen Funktionen im Gebiete der Schallempfindungen, *Arch. f. d. ges. Psychol.*, 1910, 18, 400 ff.

⁸ Cf., e. g., Boring, Urban's Tables and the Method of Constant Stimuli, this JOURNAL, 1917, 28, 280 ff.; Hoisington, *op. cit.*, 594 ff.

caution at this point may not be misplaced. It must not be thought that this 'departure' could be expressed in percentages. It is *dispositions* that we are measuring; and the application of the $\Phi(\gamma)$ -hypothesis to the problem of the psychometric function is based on the assumption that disposition is measured in stimulus units (mm.), i. e. it is the amount of the change of stimulus that directly affects the disposition for a given judgment.⁹

An example of our actual method of computation is given in Table II. Starting with the actual γ 's (col. 4) corresponding to our original p 's (col. 2), we considered the last two γ 's as fixed; and taking the difference between them as a unit, we spaced the other γ 's at equal intervals (col. 5). We then found the necessary corrections for the γ 's (col. 7) and expressed them in mm. (col. 10). These values, essential to our further procedure, will be found in col. 3, Table III. The "cor. D 's" (Table II) then represent the amount that every point must be shifted in order to come on the $\Phi(\gamma)$ -curve. Thus in the hook-curve the value which causes the inversion must be

TABLE III

Case		1	2	3		4	5	6
				B-function				
				Actual necessary corrections	Least square equation of corrective function $(y+b)\log \frac{x}{k}$			
I	B-arm (un-corrected)	.0330	4.0316	15.49 7.94 4.78 0 0			.0344	.107
I	B-arm (corrected by B-function)	.0474	13.6960		$b=4.32$ $k=7.84$	21.73 4.36 2.52 1.78 1.29	.0527	.133
II	B-forehead (un-corrected)	.1261	15.5114	5.38 0 0 — —			.0501	.129 (.066)*
III	C-arm (un-corrected)	.1281	19.4108	11.76 4.63 .59 0 0			.1324	.210
III	C-arm (corrected by B-function)	.1692	20.3833		$b=3.71$ $k=5.44$	14.36 2.31 1.03 .47 .13	.0037	.035

* 3 observation-equations, omitting the two where the weight is zero.

⁹ Boring, A Chart of the Psychometric Function, this JOURNAL, 1917, 28, 465 ff.

displaced by a large interval; i. e., the tendency of the B -function for the judgment 'two' is greatest at small separations.

We have shown in Table III (col. 3) that all three of our cases exhibit a regularly decreasing B -function. Our procedure is of little value in case II, since there is only one point to show the corrective influence; two of the points have the weight zero, and two are operative in determining the $\Phi(\gamma)$ -curve. However, even this result conforms with the general conclusion. We had not anticipated that a B -function would be found in case III similar to the B -values in case I. The existence of such a function is an indication that the true status of affairs can not be determined by bare inspection. An analysis of Riecker's results showed that another of our expectations was equally untenable; hook-curves do not always depend upon a regularly decreasing B -function. Out of Riecker's eight hook-curves not one gives this type of function. Conversely, in case III above, a decreasing B -function may exist independently of a hook-curve. The treatment of a collection of data for the two-point limen taken in the Cornell Laboratory supports the assertion that the general form of the psychometric curve and the particular nature of the B -function exhibit no constant correlation.

We have endeavored further to determine whether the B -function can be adequately represented by any simple mathematical hypothesis. For this purpose we employed straight lines, simple conics (hyperbolas, parabolas), and logarithmic curves. (It would of course be of no advantage to put a general conic through five known points, for it would fit exactly.) The curve which gave on the whole the most satisfactory results was $(y+b) \log x = k$. Using least-square equations, the unknowns b and k were determined and the hypothetical corrections were computed (col. 4, Tab. III). The latter may be directly compared with the actual required corrections given in col. 3.

We have assumed that the A -function is ideally the $\Phi(\gamma)$. The approximation of a given case to the $\Phi(\gamma)$ -hypothesis is measured by Σd^2 ¹⁰ (col. 5) or more conveniently by ϵ (col. 6), since ϵ is independent of the number of observations and is expressed in percentages.¹¹ Thus, if the departures of the A -function from the actual data are taken account of by the B -function, ϵ would be small; the use of the actual corrections (col. 3) would give $\epsilon = 0$. As a matter of fact, the logarithmic correction (col. 4), although it was the best simple formula we could obtain, increases ϵ in case I and decreases it in case III (col. 6). This result means that there probably is no simple equation for case I that adequately represents the required B -function.

CONCLUSIONS

(1) The occurrence of the paradoxical error may indicate the existence of two antagonistic functions (here called A and B).

(2) If we assume that the A -function, considered as the 'normal' function, is the $\Phi(\gamma)$, as we may do on extraneous grounds, it is then possible by mathematical analysis to obtain the actual residual values that constitute the B -function.

(3) We obtained, in our three cases, a regularly decreasing B -function, although analysis of cases in the literature (Riecker) and of data from the Cornell Laboratory shows this result not to be universal.

¹⁰ Cf. Boring, this JOURNAL, 1917, 28, 292.

¹¹ Cf. H. D. Williams, p. 222, above.

(Riecker's values were obtained under poor conditions; some of the Cornell results are based upon too few series to be finally indicative.)

(4) Such an analytical composition of the total psychometric function can not be determined by inspection.

(5) While we do not wish to generalize beyond our few cases, we conclude that mathematical analysis does, in our cases, indicate the operation of two antagonistic factors, and that such a solution suggests a dispositional or impressional account of the paradoxical error.

(6) In view of this conclusion we suggest that the $\Phi(\gamma)$ -hypothesis should not be applied to the problem of the two-point limen except in the light of a preliminary analysis.¹²

¹² A strong tendency toward the paradoxical error is easily demonstrable by the application of a single point. *B*, working with knowledge, reported 'two' (and 'three' and 'four') impressions for the single point. We were not able to discover any qualitative difference between these multiple perceptions and those obtained with wide separations.

ERRATUM

In the first part of the Checking Table facing p. 120 above, for $p = .44$, $X = O$, the value .8866 should be .8860. This correction has been made in the offprinted copies of the Table.

BOOK NOTES

Experiments in psychical research at Leland Stanford Junior University. By JOHN EDGAR COOVER. (Leland Stanford Junior University Publications; Psychical Research Monograph, no. 1). Stanford University, Published by the University, 1917. 665 p. (Price, \$3.50 for paper, \$4.00 for buckram, \$5.00 for half morocco binding.)

This is the first psychical research monograph. It is evidently the view of the Stanford University, as former President Jordan says, in his foreword, that the investigation in this field should be conducted "as in other departments of knowledge." Mr. T. W. Stanford, brother of Leland Stanford, and one of the University Trustees, contributed £10,000, the interest of which is to be applied to investigations of the fields termed spiritism and psychical research. The department of psychology was asked to assume the responsibility of applying the endowment to work in this field. The department felt it must not be hasty, but reflected that these problems were closely connected with religious interests. They recalled the Seybert Commission of the University of Pennsylvania, which was under the direction of Provost Pepper, Professor Fullerton, and Dr. Weir Mitchell, that Professor Sidgwick of England had been interested; and so slowly and deliberately the psychological department decided that it could accept the "responsibility of administering the endowment," which was large enough to defray the expenses of a fellowship and to refit a laboratory room for this work. We are reminded too of the interest of Oliver Lodge in this work. We are told that Dr. Coover, the author, was made Assistant Professor.

The work is divided into five parts: Thought Transference; Subliminal Impression; Mental Habit and Inductive Probability; Experiments in Sound Assimilation; and finally, Contributions by Professor Lillien J. Martin. The experiments here described are made with due precautions and under proper conditions, and in all lines with purely negative results, as every psychologist would expect. These results are stated with great tact by the author, who discharges the delicate duty of reporting adversely to the hopes of the donor of the fund, and probably also adversely to the interests and beliefs of the founders of the University. The author is not afraid to come into close quarters with the beliefs of spiritualists and he is tactful enough not to give them ground for offence. As an argument against belief in these influences, addressed to those who are in doubt or are inclined to believe, the work could hardly be better done or reported. If, on the other hand, we regard it from the point of view of an attempted contribution to psychology, we must conclude that it has very little value. No scientific psychologist believes in either spiritism or telepathy and he will doubtless be surprised that so much tedious pains was taken, in an inquiry which could hardly have been a true inquiry even in the author's mind at the start. The psychologist will deplore the swollen proportions of this book. Let us hope that it may at least serve as an excuse for some who have been inclined towards spiritism to draw back in time.

Moral values; a study of the principles of conduct. By WALTER GOODNOW EVERETT. New York, Henry Holt, 1918. 439 p.

Professor Everett has long been one of our most effective academic teachers of ethics and it will be a gratification, not only to his own many pupils but to all teachers of the subject, that he has at length ventured to come before the public with his ripened and tried conclusions. His hope that the work may appeal to a wider than the academic circle of readers we, too, trust will be justified, for it certainly will prove an excellent guide in the solution of many of the most insistent problems of moral life. All problems of morality here are treated as those of value, and this point of view is carried through from the first chapter to the last, where it is applied to the questions of religion. All things in the moral world are grouped as better or worse, according to their contribution to the worth of human life as a whole. "In these days of the tragic conflict of warring human loyalties, when the supreme sacrifice has been unhesitatingly made by millions on both sides, it ought to become clear, even to the most ordinary intelligence, that no feeling of inner loyalty or conscientiousness can prove a sufficient principle of conduct." Morality is the business of living with all the many complex interests that business involves.

The chapter headings are as follows: The Scope and Aim of Ethics; The Locus of Moral Values; Teleological and Formal Theories; The Development of Hedonistic Theories; Historical Sketch of Some Perfection Theories; Happiness as Ultimate Value; Perfection as Ultimate Value; The World of Values; Individual and Social Values; Duty and Conscience; Virtue as the Good-Will; Moral Law; The Ethical Interpretation of Freedom; Morality and Religion.

Psychology. By BURTIS BURR BREESE. New York, Charles Scribner's Sons (1917). 482 p.

The author seeks to give a comprehensive view of the facts, theories and principles of human psychology. He tries to represent the various points of view. Starting with the nervous system he passes to attention, sensation, organic, kinaesthetic, cutaneous, and the other sensations, perception, memory, imagination, association, conception, judgment, reasoning, affection, feelings, consciousness and behavior will, and the self.

Psychology now covers so large a field that it is almost impossible to write a textbook that gives a survey of all the field without being extremely superficial and general. The author certainly has not lived up to his ideal of representing all the points of view, for he gives little recognition to behaviorism, and almost none to geneticism. He has a warm side for the physical basis of mind but has a very one-sided and limited outlook upon the field of abnormal psychology. He gives abundant stress to tests.

The secret of personality; the problem of man's personal life as viewed in the light of an hypothesis of man's religious faith. By GEORGE TRUMBULL LADD. New York, Longmans, Green and Co., 1918. 287 p.

The chief topics treated are, what it is to be a person, from the evidence of facts and of words; the centre of personality; coming to one's self; the development of personality; the person as rational, moral, a lover of beauty, religious; the goal of personal life; and finally, faith as an hypothesis. It is a book that sums up the results

of many years of thought and reflection on the part of the author, and as one follows the thought it flows so easily and naturally, without controversy, without apparently even recognizing most of the difficulties, with almost no reference to literature, every one must congratulate the author with having found a solution, apparently so satisfactory to himself, of this perhaps the greatest riddle of the universe.

Instinct in man; a contribution to the psychology of education. By JAMES DREVER. Cambridge, University Press, 1917. 281 p.

This book is based on a doctor's thesis in the University of Edinburgh. It begins with a brief historical sketch; then comes descriptive psychology, a discussion of scientific views on the nature and meaning of instinct, its physiological and psychological nature, scientific tendencies, relation to sentiments, etc. It should be made plain that the author gives no signs of having made any study of the instincts of any animal; nor does he show signs of any great familiarity with the literature upon the subject. He is rather concerned with carrying over and applying the conception of instinct to the various tendencies that he finds in the human soul. It is an interesting and rather stimulating re-arrangement of old material in new ways, but the author's contentions do not seem to be material.

An investigation of certain abilities fundamental to the study of geometry. By JOHN HARRISON MINNICK. Lancaster, Pa., New Era Printing Co., 1918. 108 p.

The author devised five sets of tests, assuming certain abilities as essential to the study of geometry, an assumption based on teaching experience. Generally the school grades bear only a very slight relation to these abilities, though this may be due to the teacher's inability to grade the pupils properly. When judged too by the scores on any of these tests, schools vary greatly in their achievements, due in part to local conditions, but in part to the teacher's efficiency, which the author thinks would be increased if these tests were used to show where the emphasis should be placed.

A laboratory outline of neurology. By C. JUDSON HERRICK and ELIZABETH C. CROSBY. Philadelphia, W. B. Saunders Co., 1918. 120 p.

This course has grown up in the University of Chicago during the last twenty years. Many teachers have participated in the work. The purpose is to assist the student to formulate his knowledge of the nervous system in terms of the functional significance of the parts. Use is made of the methods of functional analysis of the cortical nerve system which has been developed chiefly in American laboratories.

The psychology of behaviour; a practical study of human personality and conduct with special reference to methods of development. By ELIZABETH SEVERN. New York, Dodd, Mead and Co., 1917. 349 p.

This book may best be described by its chapter heads, as follows: Some New Aspects of Mind—The Psychology of the Unconscious; Intellect—The Psychology of Perception; Imagination and Memory—The Psychology of Extension and Retention; Will—The Psychology of Action; Emotion—The Psychology of Feeling; Sex—The Psychology of the Creative Life; Self—The Psychology of the Ego.

Unidextrality and mirror-reading. By JUNE E. DOWNEY and EDWIN B. PAYSON. (Reprinted from the *Journal of Experimental Psychology*, December, 1917, Vol. II, No. 6, p. 393-415.)

The psychological clinic of the Southern California Association of Applied Psychology. Reported by F. E. OWEN. (Reprinted from the *Journal of Abnormal Psychology*, October, 1917, 16 p.)

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AN EXPERIMENTAL STUDY OF MIXED FEELINGS¹

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CONTENTS

	PAGE
Introductory.....	238
Historical.....	238
Experimental.....	240
I. Plan of the experiment.....	240
Subjects; General Method; Procedure; Divisions of the Experiment.	
II. Quantitative Results.....	243
1. Percentage of Mixed Feelings.....	243
2. Distribution of Mixed Feelings.....	244
3. Conclusions.....	248
III. Analysis of the Reports.....	249
1. Preliminary Analysis.....	249
Equivocal Reports; Doubtful Reports; Unequivocal Mixed Feelings; Multiple Feelings.	
2. Types and Forms of Report.....	252
A. Psychological.....	252
B. Common-sense Statements.....	253
(a) Objective Type.....	253
(b) Subjective Type.....	257
3. Analysis of Mixed Feelings.....	258
All Mixed Feelings of Objective Type; Localization of Feelings; Attention to Object-feeling.	
IV. Discussion of the Reports.....	261
1. The Meaning-error.....	261
Distinction between Meaning and Feeling; Confusion between Meaning and Feeling.	
2. Conditions Favoring the Report of Mixed Feelings.....	262
Intellectualization; Unpleasant Mood; Lack of Practice; Suggestion; Habituation.	

¹From the Psychological Laboratory, Cornell University.

V. Experiences Resembling Mixed Feeling.....	265
Rapid Alternations; Affective Doubt; Interrupted Mood; Meaning-feeling Mixtures.	
Criticism of Previous Experimental Work.....	268
Conclusions.....	271

The term 'mixed feeling' may be used in a psychophysical or in a psychological sense. A psychophysical mixture is a mixture of conditions resulting in a single feeling, a *Totalgefühl*, just as the mixture red and green results in a single color or brightness. A psychological mixture is the strict coexistence of two feelings, just as red and green may be experienced side by side in the same visual field. Lehmann² has compared these two types to mechanical mixture and chemical union: "Die Psychologen haben bisher scharf gesondert zwischen 'Gefühlsmischungen' und 'Gemischten Gefühlen,' welche letzteren dadurch charakterisiert sein sollten, dass die einzelnen emotionellen Elemente so verschmolzen wären, dass diese sich nicht aussondern liessen, sondern ein einziges Gefühl bildeten. Das Verhältnis zwischen diesen beiden Zuständen, der Gefühlsmischung und dem gemischten Gefühl, sollte also den Gegensätzen völlig analog sein, die wir aus dem rein physischen Gebiete kennen, den mechanischen Mischungen und chemischen Verbindungen." In the present paper a 'mixed feeling' is a consciousness in which pleasantness (P) and unpleasantness (U) are strictly coexistent, a *Gefühlsmischung*.

We make no assumption regarding the number of feeling dimensions and the number of affective qualities. We start from the fact, generally admitted by psychologists, that certain experiences are reported pleasant and others unpleasant. Our problem is simply: Do pleasant and unpleasant experiences occur simultaneously? May pleasantness and unpleasantness coexist? This is a question of fact and the appeal, therefore, is to experiment.

HISTORICAL

Orth,³ in 1903, studying the *Bewusstseinslage* of doubt, published in full 28 reports (7 tests for 4 subjects). He worked with groups of lines and points and gave his subjects problems the solution of which would arouse doubt. In his reports U is recorded 10 times (in 9) and P 5 times (in 4). A single paragraph refers to mixed feelings: "Besondere Beachtung verdienen die Aussagen der Vpn. Mayer in Versuch 7. Dort finden wir die Beobachtung von 4 sich folgenden Gefühlszuständen, nämlich erst Lust, dann Unlust, weiter wieder Lust und end-

²Lehmann, A. Die Hauptgesetze des menschlichen Gefühlslebens, 1892, 241.

³Orth, J. Gefühl und Bewusstseinslage, 1903, 127.

lich nochmal Unlust. Diese Folge scheint mir auf das Nichvorkommen von gemischten Gefühlen hinzuweisen." Hayes,⁴ in 1906, at the conclusion of a study of the Wundtian tridimensional theory writes: "To us, it has seemed best, instead of extending the method of paired comparisons beyond the point now reached to other classes of stimuli, to change the venue of the problem altogether, and to attack it on the side of *mixed feelings*. A second article will therefore report an experimental study of these much-discussed processes." The second article was never published, but Professor Hayes has kindly permitted us to make use of his results. The work was done in the Cornell laboratory in 1905-06 with two subjects, but the unpublished article is based upon 134 reports of a single subject. Pairs of simultaneous stimuli were used, a stimulus to P with a stimulus to U: (1) taste solutions containing sugar and quinine in various percentages, (2) taste solutions (sugar or quinine) and sounds (chords or discords from forks), (3) sounds (chords or discords) and odors (valerianic acid, carbon bisulphate, essence of peppermint, cinnamon). The subjects were instructed "to attend to the sensations aroused . . . and then to recall the experience and report on the sensations and affections experienced." The result of the experiment was negative; "it seems that we often have side by side in consciousness, sensations (or complexes of sensations) that when alone are distinctly P or U. Here then we might expect to find P and U side by side; but the observer confidently asserted that they never did coexist." Alechsieff,⁵ in 1907, attacked the problem from the standpoint of the tridimensional theory, combining the methods of impression and expression. Like Hayes he experimented with pairs of simultaneous stimuli: tastes and smells, tones and colors. He quotes 2 complete reports (from 2 subjects) and concludes: "Aus diesen und 27 ähnlichen Versuchen kamen wir zu dem Schluss, dass Lust und Unlust nicht gleichzeitig in unserem Bewusstsein existieren können, sie können nicht nebeneinander, sondern immer nur nacheinander von uns erlebt werden."

Johnston,⁶ in 1906, at Harvard, set out to examine experimentally "whether it is really impossible that various feelings coexist and remain distinguishable." For stimuli he used simultaneous combinations of "sounds, colors, odors, simple figures, and tactual surfaces," and for the more complex feeling-states "sentences and pictures more or less morally and esthetically suggestive." Perry pictures were cut out and presented on a colored background; the colors "were allowed to play their part in the feeling aroused." The subjects (10 men and 2 women) were unable at first to obtain mixed feelings but "after considerable training, the subjects, with a single exception, were all convinced that both feeling-tones, for tactual and visual impressions, could be present at once." Nakashima,⁷ in 1906-07, also at Harvard, studying the time-relations of affective processes, instructed his ten subjects (among other things) to pay special attention "to inhibition, reenforcement, and coexistence, if there were such processes." In the work with complex visual impressions a single sentence tells the story:

⁴Hayes, S. P., A Study of the Affective Qualities, *Am. Jour. of Psychol.*, 17, 1906, 393.

⁵Alechsieff, N., Die Grundformen der Gefühle, *Psychol. Stud.*, 3, 1907, 259-263.

⁶Johnston, C. H., The Combination of Feelings, *Harvard Psychol. Stud.*, 2, 1906, 159.

⁷Nakashima, T., Time-relations of the Affective Processes, *Psychol. Rev.*, 16, 1909, 313, 319.

"There are a few cases of mixed feelings mentioned in the records of H, F, D and T." In another study,⁸ Nakashima devotes a short section in the discussion of his incidental results to the subject of mixed feelings. One of 4 subjects reports a mixed feeling, but later declares: "I do not think (at any rate with an observer of my type) the method is suitable for settling the question." "The remaining observers are strongly of the opinion that mixed feelings do not occur." Koch,⁹ in 1911, states that "die Behandlung der Fragen nach der Möglichkeit einer Mischung von Lust und Unlust. . . Veranlassung zu besonderen Versuchen gab." He worked with combinations of colors, tones, and with tastes, smells, and pain. He notes 8 mixed feelings reported by 3 (including himself) of 9 subjects. "In mehreren Beobachtungen wird das gleichzeitige Vorhandensein von Lust und Unlust im Bewusstsein festgestellt." Kellogg,¹⁰ 1912-13 and 1913-14, in the Harvard laboratory, set out "to produce feelings as normal as possible under laboratory conditions, and in such a manner as to lead to interference." There were eight subjects in the first part (5 men, 3 women) and seven in the second (6 men, 1 woman), of whom one had also worked in the first. "For materials, picture postcards and pictures cut from magazines with a few from surgical books, were used." The pictures were exposed alternately at rates varying from 10 to about 115 per min. in a modified form of the Dodge tachistoscope. "The general method rests upon the known tendency of feelings to persist, and upon the qualitative opposition of feelings. These two opposed tendencies give something definite to be worked out." The published result contains 345 complete reports from which Kellogg draws the conclusion that "with some subjects, there is a tendency to parallelism," and further that "the occurrence of parallel or mixed feelings" is correlated with "(1) readiness of response—the occurrence of feeling even with rapid alternation—and (2) the scope of response—the occurrence of feeling from stimuli offered, despite the distraction of a task in mental arithmetic." Wohlgenuth,¹¹ in 1917, published a report of experimental work done at University College, London. He worked with single and paired stimuli, and his four subjects "had to introspect on something like 400 stimuli." A good many mixed feelings are found in the protocols, but Wohlgenuth does not mention this fact in his conclusion; he is especially interested in the differentiation of pain and unpleasantness.

EXPERIMENTAL

I. PLAN OF THE EXPERIMENT

The present experimental work upon mixed feeling was done in the Cornell psychological laboratory from October 1917 to February 1918.

⁸Nakashima, T., Contributions to the Study of the Affective Processes, *Am. Jour. of Psychol.*, 20, 1909, 184.

⁹Koch, B., Experimentelle Untersuchungen über die Mannigfaltigkeit der elementaren Gefühlsqualitäten, Halle Diss., 1911, 8, 89.

¹⁰Kellogg, C. E., Alternation and Interference of Feelings, *Psychol. Monog.*, 18, 1915, 14-18, 89-90.

¹¹Wohlgenuth, A., On the Feelings and their Neural Correlate, with an Examination of the Nature of Pain, *Brit. Jour. of Psychol.*, 8, 1917, 437-451.

Subjects. The following kindly acted as subjects: (B) Mr. H. G. Bishop, assistant in psychology; (Da) Dr. K. M. Dallenbach, instructor in psychology; (Di) Mr. F. L. Dimmick, assistant in psychology; (F) Miss C. L. Friedline, graduate student in psychology; (G) Miss J. M. Gleason, fellow in psychology; (H) Mr. L. B. Hoisington, instructor in education; (K) Miss M. Kincaid, graduate student working in psychology; (O) Dr. R. M. Ogden, professor of education; (W) Dr. H. P. Weld, assistant professor of psychology.

General Method. Our general method was to establish a relatively permanent affective consciousness of moderate intensity, and then by stimulation to superinduce a brief affection of opposite sign. If, for example, a stimulus to P is applied without disturbing the permanent conditions of U, one might expect to find a mixture of the feelings provided, of course, that the test be repeated a sufficient number of times.

At first we endeavored to catch P and U together by taking a snapshot of consciousness when we judged that the feelings had had time to mix. The subjects were instructed as follows:¹²

"In this experiment be passive and receptive. Let the experimental situation have its way with you. Make no resistance to the stimuli; let them have their full effect.

"When you hear the signal 'now,' report immediately the affective character of the experience which you were having at that moment. After this any further report, giving details of the experience, will be in order."

It was found, however, that the reports contained a good deal of ambiguity. Since in an experiment of this kind it is exceedingly important to have a clear statement of temporal relations, we decided to instruct the subjects to trace the course of feeling for a given interval. Accordingly the second paragraph of the instructions was changed to the following:

"There will be two signals: 'now. . . now.' After the second 'now' you will report the course of feeling during the interval between the signals."

This latter instruction was used for the greater part of the experiment.

Before every experimental hour we secured a written record of the subject's abiding mood.

Procedure. Every subject worked two hours a week, usually in the morning, and not on successive days. The work was uninterrupted except for the Christmas holidays.

The subject, with eyes closed, was comfortably seated in a Morris chair. The chair was in a curtained enclosure about 1.5 X 3 m. When visual stimuli were used, the room was darkened, and then illuminated by two 75 watt mazda daylight lamps about 1 m. above the chair.

The stimuli were arranged on tables outside the curtain enclosure. The experimenter entered the enclosure behind the subject, and the noise of his approach served as a preparatory signal. In the work with pictures (see below) the experimenter did not enter the enclosure, but through a trap in the curtain displayed the picture about 1 to 1.5 m. in front of the subject.

¹²All instructions were typewritten on cards 5 X 8 in.

Divisions of the Experiment. The experiment as a whole comprises four divisions.

In the first division we devised 'natural' situations that would evoke a relatively permanent feeling-consciousness. For example, we asked the subjects to omit breakfast; and when a hunger U had been obtained, we superinduced P by the smell and taste of food. In another situation P was aroused by stroking the forehead gently with velvet; U was superinduced by sandpapering the tip of the nose or chin, or by presenting the odor of stale cheese, H_2S , or asafoetida. In another situation we resorted to a form of torture in which water was made to drip on the subject's forehead and run down his face; when U was established we presented perfumes, chocolate peppermint candies, chords upon tuning forks, etc. Other situations involved P and U memories, dizziness, tickle in nose and ear with a broom straw, warmth and colds, honey, noise, and numerous other stimuli.

In the second division of the experiment we worked with single stimuli. The early reports contained a good deal of *Kundgabe*, and we thought that by simplifying the experiment a better quality of report might be obtained. The time between presentation of the stimulus and the first word of response was taken with a stop-watch. For stimuli we used 14 different odors, 10 taste complexes, 10 tactual complexes, and 10 auditory stimuli (tones and noises). These stimuli are included in the list below.

In the third division of the experiment simultaneous stimuli were used. At first a stimulus to P was presented, and when E thought that it had exerted its full effect a stimulus to U was added, and conversely. The following stimuli were used in combinations which for every subject proved to be the most effective.

1. Olfactory: vanilla, chocolate, orange, lemon, heliotrope, rose perfume, crab-apple blossom perfume, white rose perfume, turpentine, anise, cinnamon, oil of juniper, oil of bergamot, oil of mace, cloves, bitter almond, nitrobenzole, benzoyl chloride, nutmeg, coffee, asafoetida, stale cheese, onion, H_2S , castor oil, mutton tallow.

2. Gustatory: sugar solution, salt solution, quinine solution, vinegar, chocolate peppermint candy, sarsaparilla, alum solution, castor oil, solution of vinegar and quinine, apple, banana, honey.

3. Tactual: cotton (pressure and tickle), broom straw (tickle: nose and ear), sharp nail (forehead and cheek), velvet (stroke forehead), heated and cold brass (contact), sandpaper Nos. 1, 1.5, 2 (chin, nose, forehead, teeth, arm), clothes pin (pinched on nose), snap with rubber band on neck, rap with piano hammer on forehead, slap with lamella on face, pressure cold potato, itch from cowhage, current of air (on cheek or in ear).

4. Auditory: set of König forks c, d, e, f, g, a, b, c' (first accented

octave; single tones, chords, discords), blown bottles, mouth organ, harmonium, organ pipe, metal fife (shrill), metronome (various rhythms), tomtom, rattle (objects in wooden box), sizzle (lithia in cup of water), crumpling paper, crash (wooden box dropped to floor), squeak (cork turned in bottle), filing saw and glass.

The work with superimposed stimuli was not clearly marked off from that with single stimuli; the two divisions were dovetailed, so that for a number of days the experimental hour was commenced with six to eight tests with single stimuli and was completed with superimposed stimuli.

In the fourth division of the experiment we worked with visual stimuli and aesthetic feelings. Following Kellogg we used pictures¹³ but our method was different. We used large colored plates of skin diseases (40 X 55 cm.), plates illustrating the Japanese ornamental arts (30 X 40 cm.), plates of oriental rugs and runners (20 X 30 cm.), and a few Whistler etchings of smaller size. Pictures to P and U were shown alternately in both time orders. At first each picture was shown for 10 sec. so that the single test lasted 20 sec. Later 2, 3, and occasionally 4 alternations were made in the interval of 20 sec. Following Johnston we used colored forms; we combined agreeable colors and disagreeable forms, and conversely. Very little work, however, was done with colored forms, since the feelings aroused were weak and the judgments for the most part were intellectual.

In this final division of the work we also combined pictures with phonograph music, tuning fork tones, noises, and tactual stimuli.

II. QUANTITATIVE RESULTS

Percentage of Mixed Feelings. Some of the reports are clear and positive statements that P and U were experienced at the same moment (Table I, col. 1). Other reports contain expressions of doubt and uncertainty regarding the simultaneity of P and U (col. 2). Still other reports were at first equivocal, and in these cases the subject¹⁴ about

¹³ The pictures used were: *Atlas of Portraits of Diseases of the Skin*, pub. Vienna and copied London for new Sydenham Soc., 1858-84; Audsley, G. A., *Oriental Arts of Japan*, 1884, I and II; Black, A. and C., *Oriental Carpets, Runners and Rugs*, London, 1910; *Moderne Decorationsmalereien*, 3 Aufl., 1890-91; Bacher, O. H., *With Whistler in Venice*, 1909.

¹⁴ Later in the experiment we gave up the questioning method for a graphic. The subject was given paper and pencil and asked to draw the course of feeling for the period covered by the report. This suggestion came from subject K, who visualized the course of feeling. The graphic method eliminates the possibility of suggestion which is

the temporal relations. Occasionally the report was positive after the questioning (col. 3).

TABLE I
PERCENTAGE OF MIXED FEELINGS

Subj.	Positive reports	Doubtful reports	Positive by questioning	Total 1, 2, 3	Total ¹⁵ No. reports	Percentage mixed feelings
B	0	0	0	0	193	0
Da	0	1	0	1	275	0.36
Di	0	2	0	2	242	0.82
F	4	2	1	7	252	2.77
G	0	5	0	5	232	2.15
H	4	7	0	11	242	4.54
K	21	6	10	37	307	12.05
O	2	3	1	6	278	2.15
W	0	2	0	2	191	1.04
Totals	31	28	12	71	2,212	3.21

An inspection of table I shows that out of a grand total of 2,212 reports there are 71, or 3.21%, mixed feelings. Of these 71 reports 37, or 52%, are reported by a single subject (K). If we eliminate doubtful reports, there are left 43, or almost 2%, mixed feelings. Of this number 31, or 72%, are reported by subject K. If we limit our consideration to positive mixed feeling reports, we find 31, or 1.4%, of which 21, or 67.7%, are reported by subject K. Five subjects (B, Da, Di, G, W) report no positive mixed feelings. Coexisting P and U is at best a rare experience.

Not only is mixed feeling a rare experience but it is also a doubtful one. Of the 71 mixed feelings 28, or 39.4%, contain expressions of doubt and uncertainty. How far from the truth, then, is the statement of Ladd¹⁶ that "almost all mental states which are marked by strong feeling in the case of developed minds are mixed feelings!"

Distribution of Mixed Feelings. The distribution of mixed feelings according to divisions of the experiment is shown in

inherent in the questioning method; and this is especially important since (in our experience) subjects who report mixed feelings are likely to be suggestible.

¹⁵In addition to these reports there are 130 taken with 4 subjects as follows: F 35, G 46, H 28, W 21. These reports were taken (after the main experiment) with special instructions (1) to attend to the first stimulus, abstracting from the second, and (2) to attend to both stimuli simultaneously. No mixed feelings were reported in this work.

¹⁶Ladd, G. T., *Psychology Descriptive and Explanatory*, 1894, 537.

TABLE II
TOTAL NUMBER OF MIXED FEELINGS ACCORDING TO DIVISIONS OF THE
EXPERIMENT

Subject	Situations	Single R	Super-imposed R	Visual R	Totals
B	0	0	0	0	0
Da	0	0	1	0	1
Di	0	0	2	0	2
F	3	0	4	0	7
G	2	0	1	2	5
H	10	0	1	0	11
K	1	0	24	12	37
O	0	0	2	4	6
W	2	0	0	0	2
Totals	18	0	35	18	71

TABLE III
TOTAL NUMBER OF REPORTS ACCORDING TO DIVISIONS OF THE
EXPERIMENT¹⁷

Subject	Situations	Single R	Super-imposed R	Visual R	Totals
B	97	43	35	18	193
Da	72	72	97	34	275
Di	52	78	58	54	242
F	76 -	63 -	69 -	44 -	252
G	62 -	62 -	65 -	43 -	232
H	75	66	70	31	242
K	84 -	75 -	97 -	51 -	307
O	63	63	82	70	278
W	60	64	25	42	191
Totals	641	586	598	387	2,212

tables II and III. It is clear that experimentation by the method of superimposed stimuli is productive of the most mixed feelings; it yields 5.8%. The work with visual stimuli comes second, with 4.6% mixed feelings. The work with situations comes third, with 2.8%. The work with single stimuli yields no mixed feelings, although the number of reports in this division is nearly equal to that in the work with superimposed stimuli. Surely, out of 586 tests with single stimuli, we might expect to find a few cases in which a P or U mood exists

¹⁷The columns correspond to the order of the experiment with the following exceptions: 54 reports of K and 23 reports of O in the division with superimposed R were given after the work with visual R.

TABLE IV
TOTAL NUMBER OF MIXED FEELINGS ON SUCCESSIVE DAYS OF THE EXPERIMENT

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Da	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0				
Di	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0					
F	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0					
G	0	0	0	0	2	0	0	0	1	0	0	0	0	1	0	0	0	0	0					
H	0	3	0	0	2	4	1	0	0	0	0	0	0	1	0	0	0	7	3	2	2	3	5	2
K	0	0	0	0	1	0	0	0	3	2	1	0	0	1	0	0	0	4	0	0				
O	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0					
W	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0					

TABLE V
TOTAL NUMBER OF REPORTS ON SUCCESSIVE DAYS OF THE EXPERIMENT¹⁰

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
B	4	16	8	20	11	16	9	13	15	20	15	8	9	7	4	1	4	6	5	2				
Da	8	20	11	14	11	8	27	33	22	17	20	14	13	6	14	13	11	13						
Di	5	17	16	14	36	30	14	21	13	15	7	6	13	15	12	9	11	10	8					
F	21	6	11	16	10	12	22	28	20	16	14	14	14	10	3	12	11	7						
G	5	14	11	16	9	7	18	31	19	16	16	14	13	7	7	14	8	7						
H	6	18	14	16	11	10	25	26	18	18	15	17	11	6	4	15	10	12	8	10	7	12	9	8
K	4	20	18	19	8	15	29	28	18	13	13	9	8	5	9	15	15	10	10	13				
O	4	13	9	16	10	11	28	24	21	9	17	11	12	12	15	21	12	10						
W	15	8	14	8	8	7	27	29	10	6	9	8	3	5	16	9	9	10						

simultaneously with the opposite affective quality! Some of the stimuli evoke both P and U, but not simultaneously; no mixed feelings are reported in this division of the experiment.¹⁸

The distribution of mixed feelings according to successive days of the experiment is shown in tables IV and V. Table IV shows that mixed feelings are reported in sporadic groups throughout the course of the experiment. The largest group is that of K, extending from days 17 to 24, which contains 28 mixed feelings out of 76 reports. This group stands in marked contrast to the apparently 'normal' record of K on days 1 to 16. K reports a smaller group extending over three days, 9 to 11, which is similar to that of H on days 4 to 6. There are four cases of single reports on successive days: G, 14 and 15; K, 13 and 14; O, 9 and 10; W, 4 and 5. Apart from these groups lasting for several days, mixed feelings are reported at random.

TABLE VI
DISTRIBUTION OF MIXED FEELINGS WITHIN THE SINGLE EXPERIMENTAL HOUR

Subject	Day number	Number reports	Report-numbers in which m.f. occurred
G	5	9	5, 6
H	5	11	4, 5, 6, 7
K	9	18	14-17, 18
K	17	10	3, 4-6-8
K	18	12	1, 2, 3-6, 7, 8-12
K	21	7	2, 3
K	22	12	8-11, 12
K	23	9	3, 4-6, 7-9
O	18	10	4, 5-8, 9

¹⁸The absence of mixed feelings in Wohlgenuth's group 1, taken with single stimuli, stands in clear contrast to the mixed feelings recorded in groups 2, 3, 4 in which paired stimuli were used. In Part I of Johnston's article, in which single stimuli were used, there is no mention of mixed feeling.

¹⁹The apparent irregularities in the number of reports given on different days are due to several factors. (1) In the early work the number of reports obtainable depended upon the elaborateness of the situation. In the hunger situation, *e.g.*, only a few reports could be obtained in the hour. (2) The number of reports obtainable with single stimuli was relatively large. The experiences reported upon were simpler than those of the other divisions. (3) When phonograph music was used only six or seven reports could be obtained in an hour. (4) In the division with visual stimuli, preliminary work was necessary such as arranging colors and forms in order of preference. (5) The experiences in the final division were more complex than the others and required longer time for report.

(Johnston publishes no data, so that we are left in the dark regarding any group-tendency in his experiment.)

III. ANALYSIS OF THE REPORTS

Preliminary Analysis. Our protocols contain a good many ambiguous reports which, if taken at their face value, might possibly be interpreted as mixed feelings. Following are a few examples:

"I felt pleased by the odor and very much displeased by the bristle" (B 22). "The tickle is U but the humor of the situation is P" (B28). "That's both P and U. . . I detected in the tasting of the candy both P and U and I should say that the P predominates" (B91). "Both Ps and Us came in there" (Di 14). "Very weakly P and very weakly U" (Di 198). "This is about half and half. Only a slight step over from P to U" (F17). "The air from the fan was P but the experience on the whole was U" (F 32). "The taste quality was P but tactually it was rather U" (G 27). "I felt the presence of the water as an undertone of P; yet the U was not at all intense" (H 44). "At times there were flashes of U. The general feeling throughout was P" (K 63). "The second was mostly P with a decided flash of U that lasted for quite a while" (K 207). "The P increased and abruptly disappeared simultaneously with the rise in U" (K 262). "A background of U with an occasional P coming in" (W 54).

Most of these reports owe their ambiguity to the omission of temporal relations. With F, however, ambiguity is frequently due to a tendency to sum up the experience as a whole. When asked what was meant by "the experience as a whole was P" the reply was that she "adds up the Ps and Us from first to last of the experience" (F 29). This tendency to add up the experience affectively is not lacking in other subjects. Da shows a marked tendency to estimate and compare the intensity of affective experiences. These tendencies to estimate and compare and summate give rise to temporal ambiguity.

It is needless to remark that in an experiment concerned with the coexistence of P and U ambiguous reports must be discarded. Even the report of a "mixed feeling," which is fairly common, does not guarantee coexistence. This may be seen in the following illustrations:

"A mixed feeling towards that clothes-pin on my nose. . . I never noticed the two elements there together. I believe they alternated" (B 149). "The mood is a P and U mixture, if I take the intermingling of the two as a mixture. . . I am never able to catch P and U alongside of each other" (B 190). "The regret is what I call a

with mixed feelings: (1) P-U, (2) equivocal U-U, (3) two fused Us, (4) P-U, (5) P-P-U, (6) P-U-P, (7) equivocal P-U, (8) U-U, (9) U-U-U, (10) U-U. This certainly looks like a group tendency!

mixed feeling. I should say it was a very, very rapid fluctuation between P and U . . . You get the succession P-U-P-U (I can't say how many times) as a unitary thing" (G 198). "The odor was a mixed feeling . . . I can't say that the affects were simultaneous; they may have been oscillatory" (O 195).

Illustrations of temporal and verbal ambiguity can be found in the protocols of Kellogg,²⁷ and Wohlgemuth.²⁸

The mixed feelings indicated in column 3 of table I contain some expression of doubt regarding the simultaneity of P and U. Following are examples:

"The P *seemed* to be riding on the crest of the mood; it seemed to be carried along by it. Here you have a U mood, and if the sensations are isolated by attention they are P, but when you attend to the whole of consciousness they are different. *I think* that in spite of the P sensations (P when isolated) consciousness was U" (Da 260). "I tried my best to see what happened when the music was playing and I got the odor; *I really don't know*. I know the music was P and I know the odor was U, but I don't know whether they were there at once. The two stimuli were there at once" (Di 182). "P though *I don't know*; I might just as well have said U there . . . *I think* I should have said P-U or U-P . . . They *seemed* to be up and down in consciousness—first one and then the other" (G 51). "The noise was U. You *seemed* to have a tone of P all the time. It bobs up every time it has an opportunity, and even *seems* to be present at the instant you said 'now' when I reported U" (H 46). "If P and U can coexist, *I guess* they were there" (K 62). "The idea of blowing on my cheek was U and the cool air on the cheek was P, and *so far as I can say* they were there at the same time" (O 135). "*I can't say* for the life of me whether the U of the dripping wet was there at the same time as the vague P of the scent" (W 39).

The mixed feelings shown in column 2 of table I contain no ambiguity and doubt. They are clear and positive statements that P and U were experienced simultaneously. Following are examples:

(U memory, perfume) "Here were two things in consciousness. There was the U situation in which I was all keyed up. I felt very tense about it and was almost on the verge of tears. Then on the borderline of consciousness was an odor which I recognized as slightly P. The U of the memory was still there" (F 72).—(Odors: cinnamon, cinnamon *plus* asafoetida, asafoetida) "P. P and U at the same time. Very U." (Answer) "I got two things, and it was as if one were in each nostril. On the left I got P and on the right I got U. It was like a stereoscope with red and green; at one moment red is there and at the next moment green is there. The thing flashed back

²⁷In the group of N referred to in Note 24 the equivocal mixed feelings are temporally ambiguous. Illustrations of temporal ambiguity are so numerous and general that it seems hardly necessary to quote specific cases.

²⁸Wohlgemuth, *op. cit.*, 442-3 (F) group 2 contains several ambiguous reports. See further 447 (J) group 2; 439-440 (R) group 3. The latter contains one equivocal and 3 doubtful reports.

and forth" (F 166).²⁹—(Sandpaper forehead, perfume) "U but still the P of the odor was present. You have U from one field and P from another. They didn't seem to neutralize each other or even to alternate" (H 16).—(Torture, perfume) "The P was a weak central core in the middle of me. The P did not extend below the thorax. The U was all over the body even to the feet, only it didn't get inside of me. They seemed decidedly there at the same time. They didn't seem to mix or fuse. They seemed to be two disparate things but they were both there" (H 60).—(Buttered toast, odor stale cheese) "P from the toast. An increase in P due to amusement. Then a slight flash of U coexisting with the P" (K 254).—(Sandpaper nose, perfume) "Both P and U were certainly there together. Occasionally each one would be there alone and the other disappeared, but in the intervals between they were there together" (K 301).—(Whistler etching, odor stale cheese) "There were touches of aesthetic P and there was the U from the odor. The odor was strong and I was still looking at the picture. When the distraction ceased I had both simultaneously. The cheese was U and the picture was aesthetically pleasant. I had both simultaneously for a moment" (O 249).

In addition to the 71 mixed feelings there are 5 reports of what we choose to call "multiple feelings." There are two cases of coexisting Us; two of coexisting Ps; and one of 3 coexisting Ps. Following are the reports:

(Mouth organ, slap face) "That is apparently twofold. There is a deep-seated resentment and the U of the sting. . . The two Us seemed to be there together" (O 151).—(Music, odor stale cheese) "The odor fluctuated with the music. At one point it is disagreeable music and at another point it is music and disagreeable odor combined. . . . I couldn't say whether both Us were there together or whether it was a combination" (O 174).—(Torture, peppermint) "The peppermint seemed to stand out as a P by itself; but the other P (of the rhythm) persisted right through" (G 55).—(Music, tickle) "Both experiences were P, and one was a tickling P and the other a soothing P. You seem to get the body divided. All down the central core and on my left I could feel the smooth swaying rhythm of the movement, whereas on the right of the head and shoulder there was this P tickling feeling" (H 73).—(Sight human flesh and bones, taste sarsaparilla) "It seemed as if I had three simultaneous Ps; there was interest in the visual, P in the gustatory, and in the olfactory. They all blend into each other and make a uniformly P experience. I think the P from all three was there together; but I distinguished the three alternately" (K 194).

So far as the problem of coexistence is concerned, "multiple feelings" resemble mixed feelings in every respect except that the sign of the coexisting feelings is the same. Like mixed feelings they also contain a good deal of doubt and ambiguity.

In view of the fact that our stimuli were chosen to arouse simultaneous P and U, the occurrence of 5 "multiple feelings" indicates that with properly chosen stimuli "multiple feelings" might be reported in equal (possibly greater) percentages with mixed feelings. "Multiple

²⁹This is probably an alternation of feeling. The mixed feelings in every case have been given the benefit of a doubt.

mixed feelings" are found in the protocols of Wohlgenuth,²⁰ Kellogg,²¹ and are mentioned by Johnston.²²

Types and Forms of Report. The reports may be grouped into two clearly-defined types: (1) psychological reports of experience, and (2) common-sense statements about the object of experience. Fortunately the bulk of our data are of the first type, while the common-sense statements are distinctly in the minority.

The psychological reports are characterized by clearness and definiteness of statement regarding the temporal relations and course of P and U during the interval reported. They contain no temporal ambiguity. They are detailed accounts of the rise and fall, the fluctuations and alternations of P and U. Examples of the psychological reports, chosen at random from our data, are given below:

(Oil mace, tomtom) "There was pretty near an equality of P and U. I got P quite strong at first and then there was a shoot of U but not extreme. Then attention fluctuated back and forth and P and U fluctuated. Now there is no difference between them. It is hop, skip, and jump—and it's all over" (Di 163).—(Picture skin disease, Japanese art) "The first was U; the next was P. A relaxed feeling—relief, no strain. There was no carrying over; the transition was quick as a wink" (F 210).—(Japanese art, noise) "P, U, P, alternating, depending on whether attention is focused on the red or the blue. Then I was conscious of the auditory stimulus but it contributed no feeling whatever" (F 233).—(Velvet, sandpaper) "First U with a varied sensory content. The P was persistent; I think it disappeared perhaps once. I don't know what to say about the rest. There seemed to be a background of U. I was uncomfortable but the sensory experiences were both P. What happened, I know, was that while I was attending to the sensory experience I got the P and as soon as it was gone I got the uncomfortableness and the U would sometimes just cut across the P" (G 171).—(Sandpaper, velvet) "First P; there is no question about it. It was followed by U. There was surprise and resentment. Then alternating P and U; then U; then P; then neutral and just at the end it was P" (H 162).—(Peppermint candy, odor stale cheese) "At first the experience was P, fairly uniform, then it became very U. The U subsided somewhat. Then just for a very short interval the P came up. Mixed with that was a U feeling of perplexity. The P preceded the perplexity; I shouldn't say they were there together. Then the U reappeared slightly more intense than before" (H 168).—(Sarsaparilla, slap) "That's a hard one; it is almost impossible. There was a P which came and went; I think it fluctuated between P and indifference. Then a

²⁰See Note 26.

²¹See Note 24, subject N.

²²Johnston, *op. cit.*, 179. "When there is a clear strife between the two, they both can exist as equal partial tones with an undertone of unpleasantness in the failure to coordinate them." We take this to be the account of a multiple feeling. Cf. Titchener, E. B., *Feeling and Attention*, 1908, 54.

sharp U which was a very sudden shift from P to U; the P was gone completely. That lasted at slightly less intensity until the second signal. The taste was baffling; it wasn't known; it was a strange something. The baffledness must have been U as I recall it now, but it wasn't there all the time and there was some curiosity mixed up with it. It's too complex!" (W 136).—(Music, picture skin disease) "U at first which increased gradually for some little time. Then gradually, not suddenly, it changed to P and then back to U, and I think that the degree of U was just as much as it was before" (W 157).—(Pictures: mural decoration, skin disease) "Mildly P which fluctuated as my eye traveled up and down. I wasn't very fond of it. Then there was an interval of practically indifference, possibly a vague P. With the second it started at U but quickly shot to U of a high degree" (W 160).

In the above examples the course of P and U is traced for intervals varying from 3 to 20 secs. The bulk of our data are of this kind. They contain no mixed feelings. They contain the statement that P and U alternated or fluctuated—sometimes slowly, sometimes rapidly, sometimes so completely 'jumbled' that a full report is impossible—but there is not a single case of coexisting P-U to be found in the reports of the psychological type.

The second type of report is characterized by common-sense statements about the object of experience, usually the stimulus-object. There are two sub-types which we shall call the objective and the subjective. In the objective type P and U are referred or attributed to the object³³, *e.g.* 'the object is P,' 'the U is from the object,' 'this is a P object,' etc. The subjective type is characterized by statement of an attitude toward the object, *e.g.* 'I like the object,' or by the effect of the object upon me, *e.g.* 'the object displeased me.'

The more important forms of the objective type are:

1. 'The object was P,' 'the object was U.'

"The tickle is U but the humor of the situation is P" (B 28). "The candy was P. The itch was U but it fell pretty much in the background when I focused on the candy" (B 83). "The mixup of the two rhythms was very U" (B 166). "The bottle was always P and the clicking was always U" (B 174). "The coolness was P; the sour was U; the bite was U" (Di 13). "The cold water was U" (O 41). "The perfume is P; the wind is P; the experience as a whole is P" (F 33). "I suppose the joke was P" (K 83). "I can't decide about the second stimulus. In a way it was P but it sent a chill down me and that was U" (K 156). "The amusement was P" (K 190). "The breeze had

³³The term 'object' is here used in a most general sense. It includes, *e.g.*, tickle, humor, candy, bottle, mixup, breeze, music, joke, idea, etc., etc. In many cases the 'object' is the stimulus-object. In some cases the 'object' is reported in a psychological form, *e.g.*, a sensation, a color, a tone, etc.

been very P; the perfume was slightly U" (G 23). "The very idea of having my neck sandpapered was U but still there was an agreeable curiosity as to how it would feel" (W 7).

In addition to the above the following are selected from the 71 reports of mixed feeling: "The mood was still apparent but the cutaneous sensations were P" (Da 260). "There is no doubt but that the music was P and no doubt but that the prick was U" (Di 184). "Putting my hand in the water was P" (G 50). "The noise was U" (H 46). "After I got the taste of the peppermint it was P but the dripping on my nose made the whole thing U" (K 62). "The second was very U" (K 166). "The intangibility of it excited my curiosity and that was P . . . When it did come that amused me and that was the P part" (K 182). "The irritation was U, so you have at the same time the U irritation and the P" (K 196). "The idea of blowing on my cheek was U and the cool air was P, and so far as I can say they were there at the same time" (O 135). "The pressure on the skin was U" (O 254).

2. 'The U is from the object,' 'the P is of the object,' 'the U is caused by the object,' 'the P is due to the object,' etc.

"The P of the peppermint was very greatly exceeded by the U of the sandpaper" (Di 20). "The U from the tickle was more pronounced than the U from spilling the stuff on my clothes" (O 23). "The odor at the end gave a momentary P" (F 13). "The feelings due to the stimuli were not P" (K 64). "P came from the auditory experience" (K 215). "A more permanent state is slightly U due to H₂S in the air" (G 13). "A mild P from the warmth of the water. Quite a strong P from the tactual pattern as I put my hand down in the water" (G 38). "The P I reported was due to the quality and volume of the odor" (G 67). "P of the food; still there was the U of the hunger but I wouldn't say at the same time" (H 1). "The U of the sandpapering was so great as to distract from the perfume" (W 9).

In addition to the above the following are selected from the 71 reports of mixed feeling: "The U of the memory was still there" (F 72). "There seemed to be both the U of the odor and the P of the rubbing" (H 10). "U but still the P of the odor was present. You have the U from one field and the P from the other" (H 16). "Slightly P from the body and more intense U from the sandpapering" (H 18). "P predominated; it was due to the amusement, the auditory experience and the rhythm" (K 196). "P caused by amusement and associations" (K 296). "P from the toast; an increase in P due to amusement" (K 254). "I got P from one and U from the other at the same time" (K 285). "First P of the odor; then U of the sound with the P odor still there" (O 140). "I can't say for the life of me whether the U of the dripping wet was there at the same time as the vague P of the scent" (W 39).

3. 'A P object,' 'a U object,' 'an object P,' 'an object U.'

"The P tones were irritating" (B 22). "The one starts up a P sensation and the other a U emotion" (Di 31). "I can't tell you whether there is any P there aside from the odor P" (Di 163). "There was a U itching on one of my legs before the odor came" (O 63). "In the original experience I didn't analyse, but as I remember it now the odor had qualities that belong to U odors and qualities that belong to P odors" (O 278). "P sensations on the right from the

warm and then P sensations on the left arm from the cold water" (Da 52). "I detected a P odor and I fully expected a P perfume, so when the U odor came it was exceedingly U" (F 7). "P, even more P than the cutaneous P" (K 179). "The P surprise seemed to fuse with the music" (H 72). "It was an ideational U" (H 226). "P expectancy before the first" (W 175).

In addition to the above the following are selected from the 71 reports of mixed feelings: "When I have a P mood the P sensations seem a part of it, but here you have a U mood and if the sensations are isolated by attention they are P" (Da 260). "At the same time in consciousness was a very P odor" (F 38). "It is difficult to say whether just the odor was there or whether a P odor was there" (O 140). "Then an aesthetic P and the U odor for the rest" (O 250). "The undercurrent of U was there at the same time as the P olfactory" (K 171). "P was largely an inclination to move toward the P sensory experience" (K 317).

4. 'P was the object,' 'U was the object.'

"The U was a sort of visceral thing" (B 175). "The P is a relaxed and at-ease feeling. The U is a muscular tightening-up and tension" (F 192). "The P is a relaxed feeling" (F 194). "It seems that the organic sensation is the P localized" (H 148).

In addition to the above the following two examples are found in the 71 mixed feeling reports: "The P was a weak central core in the middle of me. The P did not extend below the thorax . . ." (H 60). "P was largely an inclination to move towards the P sensory experience" (K 317).

5. 'The object was experienced as P.'

The following two examples are found in the 71 mixed feeling reports: "Then there was on the border line of consciousness an odor which I recognized as slightly P" (F 72). "If one is there as P and the other is there as U, then they must be there together" (K 301).

The objective type of report is characterized by reference of P and U to the object and by statement *about* the object, rather than by description and report of affective experience. The principal forms of reference and statement have been given above. Forms 1 and 3 attach the *meaning of pleasantness* (or unpleasantness) to the object. In daily life we frequently say 'the day is pleasant' or 'this is a pleasant day,' by which we signify that the *meaning of pleasantness* attaches to the day, and not that 'I feel pleased.' Form 2 refers to the object as the source from which pleasantness or unpleasantness is derived. This form resembles the stimulus-error⁸⁴

⁸⁴On the stimulus error in psychophysics see: Titchener, E. B., *Exper. Psychol.* II, ii, 1915, lxiii (and other references in index). On a similar error in the literature of thought see: Titchener, E. B., *Exper. Psychol. of the Thought-Processes*, 1909, 145 ff; 267, note 64. "The name 'stimulus error' is natural, since the confusion lies, in terms of Fechnerian psychophysics, between 'sensation' and 'stimulus.' Intrinsically, however, 'thing-error' or 'object-error' would be a better

of psychophysics. A naïve observer, *e.g.*, will state what the experience is *of* (*i.e.*, the stimulus-object), rather than describe what it *is*. The statement that P or U comes from such-and-such an object is not a direct 'report of' but rather a 'statement about' experience, *Kundgabe* rather than *Beschreibung*. Forms 4 and 5 (rare) seem to identify P or U with the object³⁵. The nature of this identification will appear later.

Reference to the object is not found in the psychological reports (see above examples); these trace the qualitative and intensive course of P and U with little or no mention of object.

There is, however, one form of report that might be confused with the psychological type. There is a well-defined tendency to abbreviate 'the P object,' 'the U from the object,' etc., to 'the P' and 'the U,' and by a further process of abbreviation to 'P' and 'U' simply. Such abbreviations resemble the true psychological form of report if considered apart from the group of reports in which they are set. That they are, in truth, only abbreviations is shown by several facts. In the first place, a good many of the reports contain explicit objective reference in one part and the briefer form in another. The following illustrations are selected from the 71 mixed feeling reports:

"There is no doubt but that the music was P and no doubt but that the prick was U, but I can't tell you whether the P and U were there at the same time" (Di 184). "The U of the dripping water seemed to be confined more to the skeletal muscles . . . The U was reduced by the odor" (H 58). "The U grew less in time and degree while the P was gaining all the time in the exchanges. Perhaps there was an appreciable interval between P and U that I should say was both" (H 208). "Amusement was the P part. The actual sensory thing was U . . . P and U were there together" (K 182). "P from the toast; an increase in P due to amusement. Then a slight flash of U coexisting with the P" (K 254). "Faint P and U running along together. The P was amusement" (K 269). "U and P were there together absolutely all the way through the experience except at the very instant that the cutaneous experience that gave U began" (K 306). "U and P were simultaneous. P was largely an inclination to move towards the P sensory experience" (K 317).

In the second place, reports containing the forms 'the P,' 'the U,' 'P,' 'U' are sometimes set in a group which as a whole is characterized by objective reference. In view of the tendency for reports of a certain type to occur in groups, it is

phrase; what the naïve observer confuses with his mental process is not the physical stimulus, but the thing of common-sense."

³⁵Koch, *op. cit.*, 10. Subject Sp, who reports 4 of the 8 mixed feelings, states: "Die Organempfindungen scheinen mir mit dem Gefühl identisch zu sein." This may be compared with H's statement: "It seems that the organic sensation is the P localized" (H 148).

probable that the brief forms are abbreviations. In the third place, the total reports in which these forms occur are exceedingly brief. In one group of mixed feelings, of subject K, the records contain little more than the bare statement that P and U coexisted. The brevity of the reports is a further indication that the forms in question are merely abbreviations.

The subjective type of common-sense report is much less frequent than the objective. It is, however, used to some extent by all the subjects, and in the case of a single subject (B) it is found in nearly 50% of the records.

The usual form of the subjective report is:

1. 'I like the object,' 'I dislike the object,' 'I enjoyed the object,' 'I was indifferent to the object,' 'I didn't mind the object,' etc.

"U; I don't like that odor" (B 8). "Just for an instant I didn't like that scraping but then I got used to it and didn't mind it because I enjoyed the warmth on my arm too much" (B 37). "Oh, that wasn't bad. I enjoyed the odor so much that I didn't mind the scratching. I didn't like the scratching but I didn't mind it much in view of the odor" (B 48). "I didn't like the music" (B 83). "I liked the first tone, but I liked the chord more" (B 113). "I liked the warmth of the thing but it was hot and I didn't like this biting quality" (B 130). "I was pretty indifferent to both. I can't say that I enjoyed the music" (B 179). "The second was U. I didn't like the colors; I didn't like it as a pictorial thing" (Di 194). "I liked the wind" (F 28). "At first I was indifferent to the odor" (G 181). "I don't like [the] . . . organ anyhow" (K 68). "I was indifferent to the whole thing" (K 188). "Somewhat painful; I didn't like it" (O 11). "An attitude 'I rather like it'" (W 132). "I found myself with the snarly facial expression that I didn't like the stuff, but there wasn't any awareness of the snarl at the time. After the second 'now' I found myself with that expression and realized that I didn't like the stuff" (W 144). "It was an 'I don't like it' attitude" (W 151).

Much rarer than the above is the form:

2. 'The object pleases me,' 'I was displeased by the object.'

"I felt pleased by the odor and very much displeased by the bristle" (B 22). "That is both P and U. I like vinegar; it pleases me" (B 91). "It hardly had a fair chance to please me because I heard the sandpaper scraping and knew what you were going to give me. This gave a little displeasure" (B 159). "At first a gentle, persuasive P; it coaxed me to be pleased" (B 168). "I don't remember that I was pleased or displeased . . . I don't like the cold water" (Di 50). "Certain parts pleased me very much and other parts were U" (H 207). "I enjoyed it and was pleased" (H 235). "I can't say that it affects me pleasantly or unpleasantly" (O 53).

The subjective type of report differs from the objective in that the former always involves the subject. Form 1 specifies

an attitude of the subject towards the object. Form 2 specifies the effect of the object upon the subject. Both forms are unambiguous. The objective type of report, on the other hand, is distinctly ambiguous, since it tells us nothing directly about the experience. If a subject reports 'the object was P' we, of course, can not doubt that the *meaning of pleasantness* attaches to the object. But what guarantee have we that pleasantness was *felt*? We may consider it probable that pleasantness was felt, but we never rise from probability to the relative certainty of direct report.

Analysis of Mixed Feelings. The 71 mixed feelings, without exception, are of the objective type of report⁸⁶. The frequency and distribution of the various forms are shown in table VII. If the feelings reported as coexisting are stated in different forms, the report is entered under two columns.

The table shows that the commonest form of report is that resembling the stimulus-error (col. 2). Of the 31 abbreviations 22 are reported by subject K.

It is certainly significant that P and U are invariably objectively referred in the mixed-feeling reports. Although it is logically possible to report a mixed feeling in the form 'I liked it and at the same moment I disliked it' or 'the object pleased me and at the same time displeased me,' there is not a single case of such subjective report. Subject B, who uses the subjective type of report in nearly 50% of his records, does not even report a doubtful mixed feeling (table I).

It is logically possible, further, to report a mixed feeling without reference at all, in the form 'P and U coexisted,' 'P and U were experienced simultaneously,' 'P and U were there together.' Of the 71 mixed feelings 16 are in this form

⁸⁶Kellogg notes a tendency to describe the object instead of feeling, but he would rather accept the "more natural form" of report than "run the risk of falsifying the results." See *op. cit.*, 60, note: "The task of the present section was so difficult that the subjects, even those of long experience, tended largely towards objective description instead of strict analysis in subjective terms. *They described the pictures instead of their own feelings.* However, in view of the interesting way in which these descriptions vary with the method of exposure, it seemed best to allow the statements to be made in the more natural form, rather than to run the risk of falsifying the results, or getting none at all by strict insistence upon the technical form of report" (italics ours). In his conclusion, Kellogg states that "*our results show mixed feelings only in certain of those trials in which the awareness of two stimuli was also simultaneous*" (*op. cit.*, 91). Kellogg's mixed feelings, therefore, like our own, are probably all of the objective type of report. With Johnston also (*op. cit.*, 177) the coexisting feelings are "feeling-tones, for tactual and visual impressions." Johnston's feelings, so far as we can make out, are referred to the object.

TABLE VII
FREQUENCY AND DISTRIBUTION OF THE FORMS OF STATEMENT USED IN
THE REPORT OF MIXED FEELINGS

Subject	'Object was P,' 'Object was U'	'P is from ob- ject,' 'U is of object'	'P object' 'U object'	'P is object'	'Object as P'	Abbreviations	
						'The P' 'The U'	'P' 'U'
B	0	0	0	0	0	0	0
Da	1	0	1	0	0	0	0
Di	2	0	0	0	0	0	0
F	1	1	2	0	1	3	2
G	1	1	0	0	0	1	2
H	2	8	0	1	0	1	0
K	7	6	3	1	1	10	12
O	1	3	3	0	0	0	0
W	0	2	0	0	0	0	0
Totals	15	21	9	2	2	15	16

Columns 1, 2, 3, 4, 5 are not exclusive. Column 6 is exclusive of columns 1 to 5. Column 7 is exclusive of columns 1 to 6.

For the number of mixed feelings reported by every subject consult Table I.

(12 reported by K), all of which can be shown positively to be abbreviations of the objective forms. There is not a single mixed feeling of the psychological type of report. In this connection it is interesting to note that the records in the work with single stimulus contain little or no objective reference. There are no mixed feelings in this division (tables II and III).

We conclude that the group of mixed feelings as a whole is characterized by reference of P and U to the object and therefore by *statement about* the object rather than by *report of* affective experience.

Not only is P (or U) referred to the object and identified with the object, but also in many cases it is localized at the place of the object. The tendency to localize³⁷ the feelings is

³⁷One of Wohlgemuth's subjects (F) reports 14 mixed feelings of which 10 contain localized P and U. Localized feelings are not lacking from the protocols of Kellogg. Here is an example (*op. cit.*, 77): "The pleasantness of Mona Lisa held over an instant, appearing localized near the center of the field; the unpleasantness from the wrench seemed to 'wobble' in from the lower left corner, and when partly in, the pleasantness from the other 'exploded' and the unpleasantness spread over the whole picture." Koch records a great many localized feelings. Note also Störing's distinction between 'Empfindungslust' and 'Stimmungslust' (*Arch. f. d. ges. Psychol.*, 6, 1905, 316-32). On localization of feeling see: Titchener, E. B., *Feeling and Attention*, 1908, 43-6; for criticism of Störing, see 336-7.

quite marked in the records of H, K and F. Following are examples of localized mixed feelings:

(Odors: cinnamon, cinnamon *plus* asafoetida, asafoetida) "I got two things and it was as if one were in each nostril. On the left I got P and on the right I got U" (F 166).—(Torture, perfume) "I seemed to have both elements there. The perfume was very, very P and it was as though you felt it in the center of your body right up through the viscera. The U of the dripping water seemed to be confined more to the skeletal muscles (the outside muscles)" (H 58).—(Torture, perfume) "The P was a weak central core in the middle of me. The P did not extend below the thorax. The U was all over the body even to the feet, only it didn't get inside of me" (H 60).—(Imaginary stink, perfume) "I had a kinaesthetic experience as though I were being pulled apart . . . The pulling apart was U. It was well down in the abdomen whereas the P you seem to feel in the upper part of your chest. Both were there together" (H 67).—(Velvet plush on right cheek, sharp nail on left cheek) "U and P were there together; . . . The feelings were not located exactly at the point of the sensory experience. They were spatially on the left and right portions of my head" (K 306).—(Pressure: cotton, sharp nail) "This time they are localized. It seems to be a split of body as well as feeling. On one side feeling U seems to be localized and on the other side feeling P seems to be localized. The spatial separation happens only when P and U are of the same intensity" (K 309).—(Pressure: cotton, sharp nail) ". . . The feelings were localized in the cheeks. When they occur together they are practically of the same intensity" (K 312).

The coexistent 'object feelings' are sometimes the objects of attention. Note the following examples:

Subject K somewhat ambiguously reports that P and U are attended to. "It was a question of attention which was predominant. The P or U came according to *which one* I attended to" (K 166). "There was an undercurrent of irritation which was U because I wasn't able to give my full attention to it" (K 171). "They (P and U) were both there and I didn't seem to attend to *both* at the same time" (K 283). "Then P and U were certainly there together. There didn't seem to be any opposition. I could attend to *both*" (K 285). "It required attention to keep the P in, but under attention *both* were there together. The U was there whether I attended or not, but when I did attend *both* were there. Attention brought the P in" (K 298).

The statement that P or U was in the background or foreground of consciousness, in the sense of attention, is fairly common. "Then there was a P but the U still seemed to be there in the background . . . The background and the P on top are there together" (F 169). "The P was either in the background or the focus all the time" (G 198). "I seem to get just a lively, little P there in the U background" (G 122). "I know that I had the bitter as a background for the sweet but I really don't know whether or not the U of the bitter was there at the same time" (W 50).

Our analysis of the 71 mixed-feeling reports has shown that they are all of the objective type. P and U are referred to the object, or attributed to the object, or identified with the object. P and U are frequently localized at the place of the ob-

ject, and are sometimes 'attended to' as one attends to a sensory object.

IV. DISCUSSION OF THE REPORTS

The Meaning Error. In discussing the objective type of report we found it necessary to distinguish²⁸ between the *meaning of pleasantness* and *pleasantness felt*. This distinction is implied in the reports of the subjects, and in some cases the difference between *meaning* and *feeling* is explicitly remarked. It is, for example, clearly shown by the following:

"The ugly one gave me an incipient shrinking in the stomach like nausea. That meant U but it didn't seem to be U" (B 187). "I had visual imagery of pineapple which was a little towards P because the meaning was 'something to eat that is P'" (Da 60). "I imagined several situations that have been U in the past but the U of these situations was not repeated. The attempt to find a U situation failed and then I turned to some future situation that might be U" (Da 69). "You assume, I suppose, that honey is P, but I don't think it is in this situation" (Di 38). "The U dwindled off but the U stimulus was still there" (F 249). "I thought 'that's a U smell.' It was purely ideational" (G 232). "There was the consciousness that U ought to be there, but that consciousness never did grow into U" (K 238). "I recognized the odor as one that might be U but it was P" (O 177). "There was a sensation of warmth with anticipation that it might become U, and there was a pressure that I recognized as an experience that was supposed to be U, but the experience was neither agreeable nor disagreeable" (O 257).

Not only do the reports demand the distinction between *meaning of pleasantness* and *pleasantness felt*, but also they bear unmistakable evidence of a confusion between *meaning* and *feeling*. This confusion is either (1) the identification of pleasant feeling with awareness of pleasant object, or (2) the inference of pleasant feeling from the awareness of an object that *has been* pleasant or that *usually is* pleasant, *i.e.*, an object that carries the meaning of pleasantness. The following reports illustrate the confusion:

"The P sensations on the margin of consciousness colored all of consciousness even though the images at the focus were U: I mean they were the same ones that before were U, but they were not U when experienced with the P" (Da 67). "Taken separately there was a strong P and a strong U but I don't know what happened. If I wasn't critical I'd say that I had both at once, but I don't think I did . . . The U was the U of the whole situation, of thwarting something I wanted to do; it was not a U stimulus. I tend to think in terms of two stimuli and say that they were both present, but the whole situation

²⁸Kellogg does not explicitly draw this distinction. On the contrary he remarks that there is "a much closer relation of feeling and intellectual processes than has usually been taught. 'Feeling' and 'meaning' often seem well-nigh identical" (*op. cit.*, 89).

odor which I *recognized* as slightly P" (F 72). "I *knew* the picture was P and I wanted to look at it, but the interference was U" (Di 241). "It was very U before it arrived, and when it arrived I *knew* I liked it, but the other was too U to let me attend to it" (K 67). "I *apprehended* something U. I'm not sure whether the apprehension was U. It certainly wasn't P and it wasn't indifferent" (K 178). "I noted a form that I didn't like and a color that I did like. The thing came as a whole and I *cognized* the U form and the agreeable color" (O 224).

Frequently the judgment, or decision, or apprehension is followed by common-sense explanations. "Extremely P due to two factors: it was P because I expected something P and it was also sensory P" (K 183). "U for two reasons: I expected one more note and didn't get it and that irritated me; the second element was the U jangle" (K 184). "I was pleased because I got it into my mouth" (Di 1). "That cutaneous impression wasn't P or U because I didn't know how to react to it. That seemed to be why it wasn't P or U" (Di 159). "You needn't think that it was P because I was laughing. The reason I laughed was a reflective flash of how silly it was" (K 64). "U because I needed my hands to keep the water from running down my neck" (K 65). "All those noises are U because they disturb a P equilibrium" (K 110.)

Such rationalizations merely attach the meaning of P (or U) to the object.

A second factor favorable to the report of mixed feelings is the presence of fatigue, illness, sleepiness, worry and other unpleasant moods. This fact is shown in tables VIII-A and VIII-B. We have classified the moods (recorded before every

THE RELATION OF MIXED FEELINGS TO MOOD

TABLE VIII-A

	P mood	Indifferent	U mood
Total days.....	50	70	50
Days on which m.f. occurred.....	3	17	14
Per cent days on which m.f. occurred.	6	24	28

TABLE VIII-B

	P mood	Indifferent	U mood
Days on which m.f. occurred.....	3	17	14
Total reports on these days.....	26	191	142
Total m.f. on these days.....	4	35	32
Per cent of m.f.	15	18	22

experimental hour) under three headings. By a 'P mood' we mean the report of pleasantness, cheerfulness, energy, keen-

ness for work, etc. By a 'U mood' we mean the report of unpleasantness, fatigue, illness, sleepiness, depression, etc. By an 'Indifferent mood' we mean (1) a mood that is neither P nor U, or (2) a 'mixed mood' which contains both P and U elements in alternation. B reports a good many 'mixed moods' the components of which are never present simultaneously but always in alternation. From these tables it appears, both absolutely and relatively, that a U mood is favorable to the report of mixed feelings.

Following are a few citations from the moods on 'mixed feeling' days (Table IV):

"I have had an attack of migraine. Am indisposed and disagreeable . . . (later) This headache makes it difficult to observe" (Da 17th day, the only day this subject reports a m. f.). "My mood is dull gray. I am rather tired" (F 11th day, 3 m. f.). "Very tired" (H 14th day, the only day in the last three divisions on which there is a report of m. f.). "Deep physical and mental weariness probably due to bad headache. Inability of mind to drive body. I knew I was late to the experiment but couldn't hurry much" (K 5th day). "Too sleepy to be anything but disagreeable" (K 13th day). "My mood is subdued, not very P. Great lassitude and inactivity" (K 19th day). "Too weary to have an intense, lasting mood. The weariness itself is slightly U" (K 23rd day, 5 m. f.). "Neutral . . . (later) I don't think I introspected very carefully to-day. I have had an hour-and-a-half session with X and this was tiring" (O 18th day, 4 m. f.).

A third factor favorable to the report of mixed feelings is lack of practice and training on the part of the subjects.

At the close of the first division of the experiment we were left with the result that H had reported 10 mixed feelings (75 reports), F 3 (76 reports), G 2 (62 reports), W 2 (60 reports), K 1 (84 reports) while B, Da, Di and O had reported none (Tables II, III, IV, V). At this point in the experiment we were ready to accept coexistence as a fact. The experiment was continued (1) to increase the number of mixed feelings, (2) to see if the four subjects who reported none would eventually report them, and (3) to get reports more psychological in their form of statement. We noticed that the reports contained a good deal of *Kundgabe*, and accordingly at the start of the second division of the experiment the subjects were warned against the "stimulus-error."

This instruction to avoid the stimulus error apparently had a good deal of effect in the case of H and F. After the warning H's type of report changed suddenly from the objective to the psychological and the reports remained psychological for the rest of the experiment. With this change mixed feelings disappeared, except for a single doubtful case (14th day, mood "very tired"). With F the change from the objective to the psychological type of report was gradual. In the fourth and final section of the experiment, however, her reports are entirely psychological and here there are no mixed feelings. The disappearance of mixed feelings with the change from the common-sense to the psychological type of report is of paramount importance. It shows that lack of practice and training in affective report is a condition favorable to mixed feelings.

The effect of practice is not so marked with the other subjects. K, indeed, shows a positive decline from fairly careful objective report to brief and seemingly perfunctory statements.

A fourth factor favorable to the report of mixed feelings is suggestion.⁴⁰

The large group of mixed feelings reported by subject K on days 17 to 24 demands a special word of explanation. K reported a single case of coexistence in the work with situations (84 reports), and not even a doubtful case in the work with single stimuli (75 reports). Yet in the two final sections of the experiment (97 *plus* 51 reports), the record for 8 successive days shows 4, 7, 3, 2, 2, 3, 5, 2 mixed feelings. Previous to this group the record of K was normal. Some new factor must have become operative about days 16 or 17.

We learned that K, in fact, at this time became (or was made) aware of the specific object of the present investigation. Here is evidence of suggestion. A quantitative study of the reports also reveals the fact that K is given more to anticipation of P and U than any other subject. Moreover, she sometimes reports "P as usual." "U of course," etc.,—phrases which indicate suggestibility. We can fairly conclude that suggestion is favorable to the report of mixed feelings.

A fifth factor favorable to the report of mixed feelings is habituation to a form of report.

We have noted that mixed feelings occur in sporadic groups extending over several days and that within the single experimental hour they tend to occur in consecutive reports. Since our stimuli were presented in haphazard combinations, approximately the same for all subjects, this group-tendency cannot be due to the achievement of specially refined external conditions such as, *e.g.*, a nice intensive balancing of stimuli. Probably it is due to the persistence of internal conditions: lack of training, suggestion, or illness. But within the single experimental hour it is difficult to see how such general conditions can account for the tendency for mixed feelings to occur in consecutive reports. This tendency, we believe, is due to the persistence of a set or determination to report in a peculiar manner. The subject becomes habituated to a given form of report.

V. EXPERIENCES RESEMBLING MIXED FEELING

There are certain types of experience which simulate co-existing P and U and which are, in fact, sometimes reported as "mixed feelings." These types are illustrated below.

⁴⁰Johnston, *op. cit.*, 163. "There is a great danger that the investigator will unwittingly make suggestions to the subjects by his questions. There is a great danger of auto-suggestion on the part of the subject. The likelihood is also considerable that the subjects will fall into stereotyped forms of expression and general listlessness in introspection. . . . Again the special mood of the day will necessarily tend to affect all such feeling-attitudes toward slight stimulations supposed to have a feeling-tone."

first was an agreeable feeling and as it went on there was a question whether it would remain agreeable, and there was the anticipation that it might become disagreeable" (O 76). "The taste was P but it had a hint of disagreeableness. I can't say that it was disagreeable" (O 132). "I recognized the odor as one that might be U but it was P" (O 177). "I like that despite the fact that I know I'm not supposed to" (B 111). "I like being resentful at that—P. It is a P I disapprove of" (B 132). "I enjoyed being mad at a thing like that and that was P. It seemed such a proper thing to be angry at two conflicting rhythms and the appropriateness of it pleased me" (B 166).

In many of the meaning-feeling mixtures the meaning and feeling are not present simultaneously but in some sort of alternation. Under the head of simultaneous meaning-feeling mixtures we might classify our 71 "mixed feelings," since there can be little doubt that one, or both, of the coexisting "feelings" is a meaning that attaches to an object.

CRITICISM OF PREVIOUS EXPERIMENTAL WORK

The experiments of Orth, Hayes, and Alechsieff yielded a negative result; no mixed feelings were reported. Since the number of reports in these investigations was small and the number of subjects few, possibly mixed feelings would have been reported had the work been extended. Kellogg remarks⁴¹ that "Alechsieff's results only go to confirm our own." We do not see how a negative result 'confirms' a positive; but since "there were several hundred trials which gave this same result" there is certainly no contradiction between the early negative and the more recent positive results. It is probable that the subjects in the early work had had a good deal of practice in affective report before the problem of mixed feelings was attacked; at least the account of mixed-feeling experiments is given at the very close of the articles of Orth, Hayes, and Alechsieff. Since two of our subjects showed a distinct practice-effect, it is possible that the training gained in these extended investigations of feeling is a factor in the negative result.

There can be no doubt that mixed feelings are reported sporadically by certain subjects. This result confirms Johnston, Nakashima, Koch, Kellogg, and Wohlgemuth. Our stimuli include all the types used by previous investigators and our results, both quantitatively and qualitatively, are in agreement with theirs. However, we differ from Johnston and Kellogg in the interpretation of the facts. We can not accept mixed feelings as accurate reports of affective experience since an analysis shows that they involve a confusion between 'meaning of pleasantness' and 'pleasantness felt.' This confusion was discovered and reported by the subjects themselves.

Johnston⁴² is concerned with other problems than mixed feeling. For example, he is interested in the description of simple feelings, the bodily accompaniments of feeling, the temporal relations of feeling-tones from simultaneous stimuli, etc. It is all the more important, then, that we be told how long the work upon mixed feelings lasted

⁴¹Kellogg, *op. cit.*, 91.

⁴²For a criticism of Johnston's work see: Titchener, E. B., *Feeling and Attention*, 1908, 48-55.

and how many reports were given; but Johnston does not print a report or a figure. He merely states his conclusions without showing how they follow. Under these conditions we can not give a great deal of weight to his generalizations.

Kellogg's method is not adequate, although his experimental conditions are favorable to the report of "mixed feelings." In the first place, the use of picture-stimuli favors intellectualization and the meaning-error. In our experience the feelings evoked by pictures are weak when compared with those aroused by hunger, nausea, putrid odors, candy, perfume, warmth, music, etc. In the second place, rates of alternation varying from 10 to 115 per min. are not favorable to the rise of feeling. According to Nakashima⁴³ "the shortest time necessary for the affection to arise varies from 0.72 to 1.08 secs." This indicates that no feeling alternations can be obtained at rates above 55 to 83 per min. Kellogg⁴⁴ himself notes that feeling disappears at about these rates of alternation. Even the slowest rate (10 per min.) gives barely enough time to establish a feeling of moderate intensity. In the third place, the duration of the test was too long for accurate observation. Considering the printed exposure times as representative, we find the following distribution:

Duration of test.	10"	20"	24"	30"	40"	45"	60"
Number of reports.	6	23	4	167	24	55	18

This gives an average duration of 34.1 secs. Our subjects complained that 20 secs. was too long, and we found 5 to 15 secs. the most satisfactory interval. Very few subjects could give an accurate report of an affective experience of any complexity lasting 60 secs.! These long exposures favor confusion of memory and hence the inference of feeling from meaning.

Kellogg claims to have found a positive correlation⁴⁵ between "(1) Tendency to parallel or mixed feelings and quickness in response," and "(2) Tendency to parallel or mixed feelings and scope of attention." To determine 'quickness in response' he increased the speed of alternation of his pictures and then decreased it again in order to determine the point at which feeling disappeared, the assumption being that the greater the affective sensitivity, the faster the rate at which the subject could obtain feeling. The number of tests was small, and they were made with both 'passive' and 'active' attitude, but despite these considerations the subjects are rated according to 'quickness in response' and a correlation of .562, P. E. .101, is worked out according to Spearman's foot-rule. In order to test this result we have resorted to the temporal records in our work with single stimuli. Our subjects were instructed "to report immediately upon the affective character of the experience." The time was taken with a stop-watch between the presentation of the stimulus and the first word of response. Although the values are not affective reaction-times, they should be sufficiently accurate for determining gross

⁴³Nakashima, T., Time-relations of the Affective Processes. *Psychol. Rev.*, 16, 1909, 310.

⁴⁴Kellogg, *op. cit.*, 83-7.

⁴⁵Kellogg, *op. cit.*, 88.

differences in 'quickness of response.' These results are tabulated below:

Subject	K	G	F	Da	W	Di	H	B	O
Number reports.....	45	39	42	45	41	43	25	25	32
Av. time (secs).....	3.4	3.6	4.6	4.9	5.1	5.1	5.8	7.1	10.3
M.V. time.....	1.0	1.4	1.4	2.4	1.8	1.8	1.7	3.8	4.3

If we consider the *number* of "mixed feelings" reported, we find the following rank order: K, H, F, O, G, Di and W, Da, B (Table I). The two series show a correlation of .43 (somewhat less than Kellogg's, but still positive) with a P. E. of .14. Our correlation is between the tendency to *report* "mixed feelings" and the tendency to respond quickly. If, however, we group the subjects according to type (as regards the report of "mixed feelings") the result is very different. Five subjects—B, Da, Di, G, W—report no unequivocal "mixed feelings" and belong to a single group. Two subjects—H, F—at first report "mixed feelings," but show a practice-curve. Two subjects—K, O—report "mixed feelings" and show no practice-effect. K and O belong to the same group as regards the tendency to report "mixed feelings," but K's responses are the quickest and O's the slowest! We believe that K's quick responses are offhand reports, while O's slow responses are reflective judgments. Both types⁴⁶ of response are favorable to the report of "mixed feelings." As regards the second correlation, "scope of attention" was not measured by us. Kellogg's subjects were asked to do mental arithmetic while the rate of alternation of the pictures was being gradually increased and decreased, and to report when feeling disappeared. The assumption underlying the method is that the ability to do mental arithmetic and to obtain feelings from rapidly alternating pictures indicates "scope of attention." Kellogg, however, notes⁴⁷ that the results "are not very satisfactory, owing to the fact that the adding soon gets mechanized, and also that some of the subjects add visually, so that interference of an unwelcome sort came in. Still, though two series are hardly a sufficient basis for generalization, the results seem to indicate that distraction has less inhibitory effect with those subjects who have the stronger tendency to mixed feelings." If range of attention were accurately measured, we should probably find a constant: but a measure of attention that is to be correlated with tendency to report "mixed feelings" should not involve the feeling factor!

Kellogg introduces his concluding section by the statement that "The 'law of algebraic summation' of feelings is quite inadequate to account for the results obtained . . . Simple algebraic summation is only occasional. Displeasure may inhibit displeasure, rather than add to it." Our unpublished results with controlled attention, so far as they go, seem to indicate that two simultaneous stimuli to U, or to P, may result in indifference. The matter demands further investigation.

⁴⁶There is perhaps a sex difference. The 3 women subjects are quicker in response than the 7 men, and Nakashima found a shorter affective reaction time for women than for men. (*Am. Jour. of Psychol.*, 20, 1909, 191).

⁴⁷Kellogg, *op. cit.*, 86.

Kellogg's further conclusion that "mixed feelings" occur when the 'apperceptive attitudes' are similar does not follow from his results, or at least we are not shown how it follows. There is no mention of a measure of similarity of attitude. There is, further, a confusion between (a) similarity of stimulus-object and (b) similarity of attitude.

CONCLUSIONS

1. Pleasantness and unpleasantness are not felt at the same time. So-called "mixed feelings" involve the awareness of an object to which the meaning of pleasantness, or unpleasantness, is attached. This "object-feeling" may be localized and attended to.

2. Our results compel a distinction between the meaning of pleasantness (or unpleasantness) and pleasantness (or unpleasantness) felt. "Mixed feelings" involve a confusion between the meaning of pleasantness (or unpleasantness), which is referred to an object, and affective experience. This confusion, which the subjects themselves remark, we have called the *meaning-error*. The meaning-error is favored by (1) intellectualization, (2) unpleasant mood as fatigue, illness, sleepiness, worry, etc., (3) lack of practice and training in psychological report, (4) suggestion, and (5) habituation to a form of report.

3. "Mixed feelings" are reported rarely and in sporadic groups throughout the course of the experiment and the single experimental hour. The subjects show marked individual differences in the tendency to report "mixed feelings." Five of the nine subjects report no unequivocal "mixed feelings;" one does not even report a doubtful case; another reports more than half of the total number. Of the reports of "mixed feeling" more than a third contain some expression of doubt and uncertainty.

4. There are four types of normal experience resembling "mixed feeling:" (1) rapid alternations of pleasantness and unpleasantness, (2) affective doubt, (3) the brief interruption of an established mood which is conceived as permanent, and (4) the awareness of a pleasant object while one feels displeased, or the awareness of an unpleasant object while one feels pleased.

THE HUMAN MIND
A SUGGESTION AS TO THE CONSTITUTION OF NORMAL, SUB-
NORMAL AND SUPERNORMAL MIND

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In this discussion of the constitution of human mind no arrogant assertions are set forth: it is, merely, that the writer wishes to indicate what appears to him to have been the phylogenetic course in the development of mind. Following the discussion we shall discover that an understanding of the process will lead to, not only an understanding of normal mind, but, also, of subnormal mind and of supernormal mind. We shall discover, in fact, that these phases of mind correspond very closely to the three major divisions of time. That is, that normal mind appears as Present; subnormal mind as Past; and supernormal mind as Future.

I

Involved in any discussion of the human mind is the answer to that ever-recurring question, What is mind? for there can be no intelligent discussion of mind until this question is answered. And, so, we find ourselves confronted by this question here, at the very beginning of our discussion. *What is mind?* From whence does mind proceed? Is it spiritual or material? Supernatural or natural? Is it an emanation or an expression? And how shall we reply to the question here presented, for, there is but one, after all. Examining the question carefully, we find that it is far from being an easy one to answer. It becomes in fact, very subtle and far-reaching, for, we find, that any answer that we may give to it, only suggests another question.

For instance, if we affirm that mind is a spiritual emanation, is supernatural, the query comes back, first, What is a spiritual emanation? and, second, Where does the supernatural lie? Or, if it be affirmed further that mind is a natural manifestation, an expression of organic action, again are we beset by questions. How does the natural differ from the supernatural? And, if the reaction is organic, does it pro-

ceed through a single organ? or, are all the organs involved? And these questions, as may be seen, open up a discussion in which the further questions fly thick and fast.

The difficulties of the original question now become apparent. Mind may not be described offhand by a word or two; it is a many-angled complex, and its description must embrace *all* the angles. Mind is, in my view, an organic complex in which the manifestation is through a single organ. We approach that organ through the following formula. Mind is consciousness; consciousness is recognition; recognition is memory; and memory is that faculty of the cerebral cells by means of which past experience may be recalled: In the ultimate analysis, then, mind appears as conscious memory, as memory *plus* consciousness, as *memory directed by consciousness*. Memory without consciousness would not be mind; it would be merely reflex action, merely memory revived through the reflex. All living cells have this reflex memory, but conscious memory is visible in only a certain few. Through reflex memory the cell knows what to do when an external stimulus tells it what to do; but the stimulus always is external to the cell itself. The cell possessing conscious memory, on the other hand, being self-directing, can originate an impulse. While an external stimulus can call it into action, it does not require the external stimulus.

The distinction here is a rather fine one. The situation suggests the question: If mind embraces recognition why is not reflex action mind? In the reflex there *is* recognition, else there could not be response. But there are two characteristics of the reflex that keep it always a reflex: It is inflexible, that is, the reaction is always the same; and, there is no recognition of the act after the reaction has been completed. In the reflex arc there is no true consciousness, there is only reflex recognition, just a quick, evanescent flash that leaves no conscious memory in its wake. In the thought cells of the cerebrum the reaction is different, is more complicated. We may have here this same reflex action, just reflex recognition; but we may have, also, true consciousness. Consciousness may oversee the reaction: it may receive the incoming stimulus, consider it, and return an answer or not, as it sees fit. The thought reaction is flexible where the reflex is inflexible; it has the slower, *directed* movement of real thought, while the other has the quicker, *limited*, movement of unthought. In thought the memory of the reaction remains in consciousness; in the reflex it does not.

I have said that mind is an organic complex in which the

manifestation is through a single organ; and we discovered that organ through our formula, for, having reached to the cerebral cells through it, we find ourselves within the brain itself. But now, the brain is not the only organ involved. All the organs of the body, in the degree in which they have to do with the well-being of the brain, support the reaction. All the organs are involved, but the brain is the organ of manifestation. Accepting this as a basis from which to proceed we find ourselves better able to go on with our examination into the constitution of mind. We now have reached a center from which our research may extend in all directions. Heretofore mind has been looked upon as something above brain, as something emanating from above the human plane; but now we perceive that, while the manifestation often does seem to be above the brain level, its origin actually is at that level.

The closer we examine mind as a manifestation of brain the more are we impressed by the fact that the brain is the basis of mind. Not that the cerebral cells *are* mind; they only are the basis of mind. If they were mind nothing more need be said, for the answer to the question What is mind? would then be obvious. The cerebral cell then would possess the power of supreme consciousness. But the cerebral cell does not possess that power, *not yet*, and hence the difficulty it has in understanding itself. That that is the goal toward which the cell is reaching becomes more and more apparent the deeper we go into brain history; it becomes apparent, also, that the cell still has some distance to go before it attains its goal.

And so, if we would understand mind we must understand brain; and so, if we are seeking a clear understanding of brain function, we must know something of brain history, and something of brain structure. Here history and structure go hand in hand, for, the story of brain structure is the story of brain development. This story has its beginning in the remotest of remote antiquity. So remote is it, in fact, that we have no direct knowledge as to it, such items as come to us being, as it were, but echoes that have grown faint through distance. But, as echoes, however faint, must have an origin in fact, so here, these echoes hark back to something more substantial than themselves. Advancing knowledge has enabled man to locate these echoes and to begin their classification; but it is only a beginning, for the problem is intricate and difficult, and is to be solved only through laborious effort, step by step. The echoes are not long graceful arcs revealing direct pathways between cause and effect. They are a series of short arcs mingled in apparent confusion extending in a long chain

between the remote point and the near. The difficulty here lies in tracing the proper connection between these intermediate points, in discovering the orderly sequence of the links of the chain. But already some of these points have been connected up, and now we are beginning to catch an idea as to the origin of the human brain. It is becoming more and more apparent that the human brain as we know it is but the present manifestation of a long process of evolution; that the human brain of today is but a sublimated animal brain. Among the several items already known that mark this fact, and which are, to my mind, conclusive, are the following. First. The test known as Nutting's biological blood test, as given in Vol. lxix, No. 453, of the "Proceedings of the Royal Society of London." Second. The remarkable resemblance, both macroscopically and microscopically, between the brain of man and the brain of the monkey, as revealed by the researches of a number of highly trained observers, and, especially by the exhaustive work of Dr. A. W. Campbell, of the Royal Society of London, as set forth in his book, "The Localization of Cerebral Function." Third. The obvious dominance of the animal (motor) brain in the developing brain of the child, and in the congenitally arrested brain in the feeble-minded. The first item reveals the close blood relationship between man and monkey; the second and third, their close brain relationship. Let us look into this a little more closely.

For the blood test Nutting prepares an antiserum by injecting human blood, intraperitoneally, into a live rabbit, one injection following another at intervals of three or four days until three or four injections have been made. The animal is then bled to death, and the anti-serum made from its blood. This serum added to dilute human blood causes a characteristic precipitate. Nutting has performed this test upon all known varieties of the vertebrates and has obtained the reaction in the bloods of but two: man and monkey. An interesting point here is that the blood of the old-world monkey gives a stronger reaction than does the blood of the new-world monkey. Nutting finds, also, that the bloods of different groups of animals tested by an anti-serum made from the blood of one of the group give a characteristic group reaction.

Campbell's researches have revealed a very suggestive similarity between the brain of the man and the brain of the chimpanzee. He finds the cellular and the fibre structure of the cerebral centres in the man brain practically duplicated in the chimpanzee brain, the difference between the two being, mainly, one of degree. The chimpanzee brain, mainly an animal

brain one-third the size of the man brain, has neither the area nor the development of the other. The man brain is a thought brain, but, in the chimpanzee, the motor (reflex) centres dominate. The activities of the chimpanzee follow through the motor centres, and these centres occupy a relatively greater area in its brain.

A report by Leyton and Sherrington in the *Quarterly Journal of Experimental Physiology* (Vol. XI, No. 2), on some experiments in cerebral localization upon anthropoid apes adds a further bit of evidence in favor of the contention that the ape brain and the man brain are closely related. The evidence is as follows: That the outlines of the motor area, as mapped out by Leyton and Sherrington, follow very closely the histological outlines of Campbell; that the motor responses induced by faradization of the anthropoid brain are very varied, approaching the movements of man in number; and that these movements are far more than those obtained from the dog or macaque.

Does the chimpanzee, or other anthropoid, think? That is a difficult question, but histology offers a suggestion toward an answer. The area in the chimpanzee brain corresponding to the so-called thought area in the man brain has the same cellular structure. The cells carry the same characteristics and follow the same arrangement, but they are fewer in number and lack in development; this "thought" area in the chimpanzee, while it is present, is very primitive. While brain cells are able to make themselves manifest, no brain cell can give a manifestation beyond the power of its own structure and development.

The point of greatest insistence in the animal (chimpanzee) brain is the predominance of the reflex, the predominance of the motor area. The actions of the animal *are* reflex. That is, his brain acts only in response to external stimuli. It is not a thought brain, it is an impulse brain; a reflex brain that seems to be capable of responding only when a stimulus is sent in to it. It cannot originate, it cannot think for itself, for this brain has not reached the stage of development where that becomes possible. Its thought cells have not come into consciousness, they haven't conscious memory; they do not *consciously* receive and record impressions. It is possible that they do receive impressions, but, if they do, that is as far as the reaction passes. At that point there is a hiatus; the impressions are received but not considered. There are two reasons for this. First: the animal hasn't language; and, second, as we have seen, he hasn't conscious mem-

ory. Memory in these cells is, as yet, entirely reflex; they can recognize an impulse, but they cannot, without the impulse, recall past experience. When a sensory impulse is received by this brain, one of two things happens. Either it returns an immediate reply, or, no reply at all is returned; it is reflex or nothing. This brain being a reflex (motor) brain, there can be no visible reply except through the motor apparatus. That is not to say, however, that, lacking the motor reply, there is no effect following the reception of the sensory impulse. That would be an impossibility. All stimuli *entering* the cortical cells, whether in the brute brain or in the man brain, leave some effect, however slight it may be. The effect may not be visible as a direct manifestation, but the effect remains as a permanent impression upon the cells, and, if it be repeated sufficiently often, it may, eventually, come into consciousness. In that event it becomes a part of the evolutionary process, for, it is increasing the power of the local area in the cerebral cortex; it is developing conscious memory therein. Following this argument it becomes more and more apparent that the man brain has developed through the brute brain; and we confirm the argument through the study of the child brain and the brain of the feeble-minded.

The combination of conscious memory and the higher centres has come from two directions: directly, through the reflex, and, indirectly, through muscular action. The entire process, then, may be traced to the effect of environment upon the individual; an environment ever-changing, persistent, at times almost overwhelming.

The pre-man was an individual of action, and, beginning man, being the immediate continuation of the other, possessed his characteristics. These two *animals* were nothing more than reflex automata, in whom the reflex arc was made up of environment, brain and muscle. Environment sent the message, the brain received it, and the muscles gave back the answer. In the reaction the brain was a passive agent; it did not direct the movements, it merely synchronized them. It could not direct, for it was a nonconscious organ, and was not aware of what was going on within its own confines. The movements of these primitive beings were the *quick*, impulsive movements of wild animals, not the slower, directed movements of man; they were nonconscious movements, not conscious. But the nonconscious were the forerunners of the conscious.

In these movements of the pre-man, and of his immediate descendant, the two sides of the body participated equally; they were not differentiated as they are in the man today. All

the movements were synchronized, and the two sides acted together as a whole. Not that the animal was ambidextrous. He was neither right-sided nor left-sided; *he was undextrous*. He used either side with equal facility; and, as a rule, he used both sides together. His radius of action, therefore, was limited; being reflex it was inflexible.

This may be observed today. Watch the monkeys at any Zoo. In using the hands in any ordinary capacity, to pick fleas, to scratch themselves, or to reach for anything, they use one hand as easily as the other. If they are suddenly startled they turn like a flash and jump for the side of the cage farthest from the noise, clutching it with all four extremities at once; or, if for the perch, by both hands simultaneously, not glancing toward the seat of supposed danger until they are over the first alarm. Their actions are typically reflex; they are spontaneous, quick, *undirected* muscular coordinations.

But now, as time goes on, the difference between the pre-man and man becomes wider and wider; the behavior of the animal is changing more and more, this change being due mainly to a wider use of his fore extremities. The animal now is using these extremities as hands, and, what is more to the point, as differentiated hands. Changes in his environment have placed before him increasingly difficult problems, the solving of which demanded two things: dexterity and thought. Under the new conditions he was forced to adopt different measures to preserve his own life. Where before life had been easy, now he actually had to work for a living, *to work with his hands*. And in the process the two hands became differentiated; that is, each hand approached its tasks from a different angle; they no longer were one in their actions, they were individualized. And this new hand work created new brain centres; for as the hands developed new uses, the brain followed that development. The body and the brain developed together, for the two are one and inseparable. And, so, out of the pre-man and primitive man came man, *thought man*; but he was, even then, little better than his ancestors. He was still more animal than man, an animal in whom the grosser attributes of the brute were still the dominant attributes; being the older part, and consequently the better developed, they actually were him. His brain was not yet in that state of development that gave to it the power to recognize values; the animal had not yet come into real consciousness. In fact, the degree of consciousness was very small; but the change had begun, and it was not to stop. Man had taken hold of the brute, and nothing could shake him off.

I have said that it was environment that developed man; and now I say that it was the fear of environment that developed him. Analyzing the environment of primitive man we find that that actually was so; we find that fear was the urge that impelled him forward, that impelled him to use his hands. Fear beset man upon every side; the fear of wild beasts, the fear of his stronger fellows, the fear of starvation, and the fear of the elements; literally, the fear of environment. It was this fear that begat thought. The man had to think in order to win against his environment. Mere reflex action was not now enough; thoughtless action, no matter how quick, could not avoid the new dangers; it now became necessary to understand the danger and to plan ahead of it, *it now became necessary to think*. The association of ideas brought about through the fear reaction was creating a thought reaction. This was, of course, a weak reaction in the beginning, it was little more than a complementary impulse following in the wake of a stronger impulse; but it *was* a beginning, and, as time went on, it gathered unto itself greater and greater power. And, as the power for thought increased, the motor reflex slowed down; the quickness of the animal gave place to the deliberative effort of the man.

The primitive brain had for active centres only those having control of the special senses, and those in the so-called motor area; the primitive brain was, almost wholly, a motor brain, as we have seen. Outside of the regions given over to the five senses, the regions of the brain concerned in the motor reactions were those convolutions in immediate relation to the great central fissure, the precentral and the postcentral convolutions. And these areas remained the solely active areas until the brute began to give place to the man. Then, in response to the new movements called forth by the new conditions, new areas came into activity. These new movements while proceeding through the primitive motor region, carried the brain effort beyond that. The new movements were different from the old, were finer, requiring a differentiation in muscular action and a new co-ordination in the actions of the individual muscles. This was, in fact, the individualization of the muscles themselves. And for this the old automatic centres would no longer suffice, for automatism could not direct; automatism was nothing more than reflex action. The new movements called into play a new force, a directing force, a force to which we give the name *thought*. Thought made possible the coordination and the slower and the finer actions of the muscles. Take, for instance, the development of writing. The beginning of writing was

in the drawing of straight lines and the approximation of one line to another. To the hand without a mind behind it the straight line is next to an impossibility, and the even joining of two lines an actual impossibility. But the *man in the brute* did accomplish these tasks; and then it became comparatively easy to proceed to the making of a square and a circle; and, after these it was but a step to picture writing, and a further step to the writing with letters.

This development was progressive, covering, no one knows how many thousands of years. It called into action, first, the old muscle centres in the precentral region, then a new centre in the convolutions closely adjacent to the first, and, third, another new centre in the convolutions anterior to the last. And these were not independent centres, isolated from the others; these centres were linked one with the other through the association fibres. Through these fibres the actions of the centres were synchronized. There is here what appears to be a regularly advancing developmental process. New areas come into development to receive and to direct the new sensory stimuli coming into the brain; but the new areas did not spring into existence spontaneously, not all of them together, at the same moment. This process of brain development was a slow one, covering a vast period of time, for there were many centres to be brought into function through the development of new cells and fibres. There were too many complexities to be worked out.

We are beginning to grasp the meaning and the method of brain development in the study of the developing brain, and in the study of comparative brain anatomy. As we have seen, the structural likeness between the man brain and the chimpanzee brain is very suggestive; the difference between them being mainly differences of degree. And study of the developing brain reveals how the various centres have come into action one after the other. Through this we learn that the cells in the centre for smell in the lobus pyraformis are the first to develop, and its fibres the first to become sheathed; and that the sensori-motor areas are the next. But we learn here, too, that, while the smell centre is the first to begin, the sensori-motor centres fast outstrip it. Then follow, in successive order, sight and hearing. It is only after the completion of these primitive centres that the intellectual areas develop. It becomes obvious, then, that the order of the brain is, first, primitive brain and, then, modern brain: first, reflex brain, then, thought brain; first brute, then, man.

The brain now has passed beyond the primitive stage. It

is not now an organ in which an incoming stimulus merely excites an automatic reply; it is a brain in which the stimulus is received, *considered*, and a reply, or no reply, is given, as the *reason* of the individual directs. Theoretically this gives to man the ideal brain.

But now, there is a conflict here. This ideal brain is not ideal; its judgments are not always the judgments to be looked for. Its action is not yet well balanced; all of its centres are not equally efficient, the irregularity being due to an unequal development. That is, the age of the various centres varies. For instance, the centres in the precentral convolution are the oldest of the centres, those in the immediately adjacent centres are the next oldest, and those in the area before the last are the youngest. In other words, reflex muscle-action is first, special muscle-action is next, and directed muscle-action last.

And there lies the conflict. Reflex action, impulse action, dominates the brain. It has become a habit-action; and habit-action is master-action. Thought-action has two weaknesses; its period of development has been a short one; and, it has followed the pattern of its parent, the older reflex. *These weaknesses are very strong ones*, for it is these *weaknesses* that dominate the thought function. Thought having developed through the reflex remains only reflex thought. There is here a grave defect, for, it means that, when a sensory impulse demanding thought enters the cerebral cortex, the response comes back through a reflex arc. There is no real thought attached, only a reaction along the easiest way; it is just loose reflex action. This leads often to a bizarre and disjointed thought effect, for, the thought images nearest in line are the ones most apt to respond to the impulse. This is not real thought, for there is no control of the response, no directing of the thought images into logical lines. Thought is as yet too weak to direct. The response will be according to the experience of the individual, according to his past. This means, in the ultimate, that reflex thought is merely an expression of the past. True thought is this, too; but, on the other hand, true thought is greater than this; true thought is more than just loose reflex action. True thought is *direction*, is the power to direct; it is self-consciousness directing the response. It is the man brain directing the brute brain: it is the Present directing the Past. In the last analysis, then, it is the Present, for the man epoch is the present epoch of the brain. It will not be difficult to understand from this how the Past, being older and stronger than the Present, will dominate the Present; how the reflex will dominate thought.

Mind, then, becomes a reaction between Past and Present. In this reaction there are many variations of degree leading to the different phases of mind; but in the normal mind the reaction must be equable. The present must counterbalance the past. On the contrary, if the past dominates, if the Past excludes the present, we have subnormal mind; or, if the present becomes the dominant power, we have exhibited the phase known as supernormal.

I have said that in subnormal mind the past excludes the present. Just what does that mean? How can the *present* be excluded? Actually, of course, the present may not be excluded, for, the present is all there is to life; the present closely surrounds us, environmental stimuli prick us upon all sides. But in the subnormal mind there is little or no response to the stimuli, the degree depending upon the developmental period of the brain behind the subnormal mind. Subnormal mind is the manifestation of subnormal brain, and proceeds from one of two directions: the fault may be one of structure, or one of function. Either the brain structures have not attained to a full growth, or, while they are complete structurally, they may not be functioning to their full capacity. In the latter, function may be restored, or, rather, brought out; while in the former there can be no mind manifestation beyond the period represented by the developmental stage. It becomes obvious, here, that the one form is not feeble-mindedness at all, for, if function may be restored, then the error is merely functional and not due to faults of growth. True feeble-mindedness, on the other hand, proceeds through a brain that is incomplete structurally; and, as it is the stage of brain development that determines the capacity of the mind, nothing can force the mind to an effort greater than the power of the brain behind it. In the congenitally feeble-minded the degree of mind impairment is the degree of brain lack. The brain lacks the power to respond to environmental stimuli, in fact, it might be said that a feeble-minded person is a person out of contact with his environment. It is doubtful whether the feeble-minded possess mind at all. Their mental reactions seem to be entirely reflex. They can do with their hands, but they cannot do with their heads; they can use their muscles, but they cannot use their brains. Their brains have been arrested in development, and, as this arrest has occurred before the brain has attained the man stage, its manifestation obviously cannot reach up to the man. But there is an attempt to reach up, the man cannot be entirely excluded, and the manifestation becomes, therefore, a mixed one, but, with the balance vastly in favor of the ani-

mal. The intelligence of the individual does not extend, in fact, beyond the intelligence of the animal. And, as the animal represents a past stage in the development of man, it must follow that the reactions of a brain in this stage of development can represent only the past. We have, then, to do with a brain that is out of touch with its environment, and dependent upon the past for its reactions; we have to do with a brain that has *structure* memory and not *conscious* memory. There is a brain, but the individual is no more conscious of it than he is of his other internal organs.

The feeble-minded individual, then, has no value beyond his own manifestation, a manifestation almost entirely of structure. The brain being the product of a million years, more or less, of slow effort, has had those million years woven into its structure. In the man, therefore, where the growth of the brain has been arrested, where there is no man consciousness to control its action, the action is going to proceed through those million years; that is, it is the structure built up by those slow-moving years that will give the trend to that brain. The action will be structure action, inflexible reflex action, not free, limitless thought action. The past manifests itself through that which it has reared; the present being excluded from participation in the manifestation.

But now, there are different degrees of feeble-mindedness; the exclusion of the present is in varying degree. There is the idiot, the imbecile, the moron: an ascending scale of feeble-mindedness. We have, in these ascending phases of mind, two things to consider: the influence of the dominant animal brain, and the influence of the latent man brain. While the past does dominate, there is an inward urge, a reaching out; there is the man effort exhibited in the attempt to pick up the stimuli of the encompassing environment. But this reaching out never gets beyond the stage in which the brain is set; the reach is never greater than the ability to reach. The reaction to environment is never greater than the ability of the brain to react.

In the lowest of these degrees of feeble-mindedness, the idiot, the individual may be said to be out of contact, out of conscious contact, with his environment; the brain-lack is more or less complete, varying from nothing to nothing plus. Where the brain-lack is complete we have, merely, a somatic animal, a feeding animal, not a brain animal; the individual is merely a collection of sustaining organs. In the attempt to study idiots of this degree we are baffled; not being conscious of their environment they cannot intelligently respond to it. We can

make no more of an impression upon them than we can upon wild animals. Their behavior is very animal-like. In some the disposition is mild, in some ugly; they make guttural sounds; they "bolt" their food, sometimes holding food or saliva in the mouth. If we speak to an idiot of this grade he gives no sign of understanding. In fact, he pays not the slightest attention to us, no more than if he did not hear. And he does not hear, that is, he does not hear the words, he does not understand words: not possessing language he cannot understand. He behaves as would any animal under like circumstances; he behaves as would any dumb brute who possesses neither language nor reason. On the other hand, an idiot of higher grade, one whose brain lack is lesser, is capable of making some response. This one, too, is unable to speak a single word, but he can understand, to a very limited extent, what is said to him. He comes when he is called; if we offer to shake hands with him he timidly places the fingers of one hand in ours; he even can make marks with a pencil upon paper, but the lines are meaningless, crossing and recrossing one another aimlessly.

What marks the difference between these two types? Is it not that in the second case, the idiot of high grade, there has been some *conscious* contact with environment? As a baby he was fondled and talked to, as all babies are; and his cortical cells were able to receive these stimuli, and to respond to them, up to a certain point. He thus received some training in the essentials of the man-brain up to the time when his brain ceased further to register impressions. But whatever that brain has learned, little as it may be, remains within its memory, remains as the merest rudiments of intelligence; and being rudiments they are reproduced as rudiments. It is characteristic of the brain, especially of a brain in the very beginning stage of development, that it reproduces as it has learned.

The idiot is an anachronism; he is an individual with his dates badly mixed; he belonged upon this earth half a million years ago. He exists in the past tense; he is the animal in whom the human manifestation is in the very beginning stage. The fact that the high grade idiot can understand some words, but not repeat them, proves one very obvious law of brain development: that sensory stimuli are recognized long before the brain is able to reply to them. This is, in very truth, the fundamental fact of development of cerebral cortex, as suggested by the researches of Flechsig and others on the myelination of the nerve fibres of the brain. Through these researches it has been discovered that the sensory fibres acquire

their sheaths before the other fibres, the motor fibres being second, and the association fibres last. It is a matter of common observation that, in developing function in the brain centres, it is necessary to send the developing sensory stimuli into the centres many times before they take on the function; it is necessary to put the centres through this training before they are able to act for themselves. It seems to be necessary that the centres receive this stimulation before their outgoing fibres, both motor and association, can come into usefulness.

Coming to the imbecile we reach another stage in the development of language: the imbecile not only understands words, but he also can repeat them: but he can understand many more than he can repeat. He has a vocabulary ranging from a very few words to several hundred, the number depending upon the degree of his imbecility. The words that he can repeat are those best suited to his immature brain; they are short words of one syllable, or, words of two syllables in which the two are easily pronounced, or, are similar, such as "papa" and "mama." With the words at his command he even can form short sentences; but in any of his uses of his words he is very uncertain. He does not always sound them correctly; he does not always put them together correctly; he does not always use them with good sense. Words are for him little more than bare sounds; they suggest little or nothing to his mind. In order to have any significance at all there must be an image that identifies the word in his mind. Mama is such a word; the image of the mother always accompanies it. As a baby the individual heard it constantly from his mother's lips; the word and the object were closely associated in the baby's mind. This constant association and this constant repetition indelibly impressed the word upon the baby brain cells. The baby learned the meaning of the word and how to use it; and even though the baby brain never developed beyond the baby stage, that which the brain had learned remained as an integral part of it. And, further, the imbecile can understand longer words than those he can utter; he can understand longer sentences than those he can repeat. This we should expect, knowing the manner of the development of the sensory fibres of the human brain. As in the high grade idiot we find the brain reaching out beyond its limit; it can receive far beyond its capacity to manifest. It is this reaching out, this ability to receive, that represents the human side of the brain; it is the backward pull, the inability to respond to the incoming stimuli, that represents the animal side.

would lose their human characteristics and become actual animals. And that is what almost happens in the lower grades of feeble-mindedness. Language gives fluidity to thought. It is possible to think without the use of words. But, without words, it is impossible to give expression to thought. This does not apply to the individual who, while in the full exercise of the power of speech, suddenly loses it; it has reference only to the individual, man or animal, who is born without language.

Leaving, now, the subnormal, let us consider the normal: the normal human brain. The beginning manifestations of the normal human brain, as we observe them in the infant and in the child, are very similar to the manifestations of the subnormal brain in the feeble-minded. The two hark back to the very beginnings of the human race; the brain of the child represents the early stages of the racial brain. The brain of the child is a motor brain, a brain of action, of reflex action, in which the thought faculty is just beginning to assert itself; it is the brain in which the animal and the man are commingled, but with the animal attributes in control. We should expect, then, that the manifestations of such a brain would be the manifestations of the period represented by its development; and so we find them. The animal attributes are in the ascendancy, while the higher faculties are in the primitive stage: thought, reason, speech and language are very imperfect. The reason for this will be easy to grasp if we understand the phylogenesis of man.

The life of man upon the earth may be divided into two periods: the ante-natal and the post-natal. The ante-natal period embraces a million years, more or less, and is the period of development of the merely animal brain, *the foundation of the man brain*; The post-natal period embraces the years that have gone into the development of the actual man brain from the animal brain. In the latter are included all the thousands of years between the present-day man and beginning man, as well as the few years of actual earth existence of the individual after his birth. Within these periods the man brain has developed; so, that, it is not at all surprising to find, in the brain of the individual, manifestations of the two periods, working side by side.

But, while these manifestations are working side by side, they are not working in harmony. It is true that, in the beginning, the animal attributes hold the advantage, but they find it more and more difficult to keep that advantage. The man attributes are there constantly endeavoring to obtain the mastery; but, being younger in point of development than the

others, they are handicapped, they have to fight to maintain a foothold. But theirs is a battle of time. If they are not able to win all at once, they are content with the mere foothold, knowing that, once the foothold is secure, it cannot be displaced. The placing of one foot leads to the advancement of the other; and so, step by step, with eternal patience, is their progress made. The animal attributes gradually are pressed back; but their retirement is attended by violent efforts at maintaining their positions. And it is this very violence that keeps them so much in evidence. Their manifestations are unequal, uncouth, explosive; they are merely undirected, reflex outbursts.

It is the influence of the higher faculties that is going to equalise the animal manifestations, that is going to refine them, that is going to tone them down. Impulsive reflex action is going to give place to deliberative action, to directed action; mind is going to rule, not brain. The Present is going to direct, not the Past. The individual is going to supervise his own brain development; he is going to learn how to put ideas into his brain to his own best advantage. The sensory stimuli are going to be received intelligently and assigned to their proper places. Out of instability is to come stability; out of disorder, order.

But the Present must not be allowed to overdirect; the individual must not be allowed to become supernormal; too much emphasis must not be put upon the brain during its developmental period. The supernormal brain is a brain in which the congenital development of the cerebral structures is advanced beyond the normal period. It is one in which self-consciousness develops too early, in which the reach is beyond the present; the supernormal is a projection into the future. There is a supernormal development of the brain structures, through which the brain centres become abnormally responsive to sensory stimuli. The incoming stimuli are picked up with avidity and thought is excited without effort. The mechanism approaches perfection in its action; the brain cells are ready, and eager, for work; the association fibres have taken on premature activity and are ready for the transmission of correlating impulses between the centres; the motor fibres, in alignment with the others, transmit the outgoing impulses without hesitancy and without error. This brain, acting in the present, is acting only as a future brain can act.

But all this is not so well as it appears; perfection has arrived too early. Brain development must not be pushed beyond normal limits; *the centres of the human brain must not*

be put under forced development. Normal development is slow development. The normal brain is not born already developed; *it is born to be developed*, and the period of that development is an extended one. In developing a normal brain we must follow the developmental plan of Nature or we shall encourage disaster. The supernormal brain, the brain that has received a too early development, easily is thrown out of balance, and is less apt to endure. The force that directs the upbuilding of a human brain, though slow moving, is a tremendous force. If we attempt to crowd it, to increase its progress, we have to increase its rate: we have to increase the pressure upon the immature brain cells. These cells are the highest form of living tissue; they are the most highly specialized of all the cells of the human body. They possess, then, in the highest degree, that quality peculiar to all living cells known as irritability. If, then, these cells are pushed in their development, if they are urged beyond the normal rate, it is natural to suppose that this irritability is increased. That being so, the cell itself must suffer some injury. And that seems to be the fact in the supernormal, for the supernormal individual, while he may give splendid service for the time, gives out early, and, moreover, his service is apt to be irregular. His cells, having come into full maturity prematurely, have shortened their existence that much; and, having to carry on their further existence under pressure, are shortening it still more, as well as manifesting irritation symptoms that are the direct outcome of the over-pressure. In the supernormal the Present, not content with its own progress, projects itself into the Future: *the Present devours the Future.*

The behavior of a supernormal individual is in accord with the over-development of his brain. His bodily activities keep pace with his mental; his muscle responses are quick, spontaneous and over-abundant. All the cells of his body are participating in the over-activity, all are rushing, with headlong speed, to their fate.

In conclusion:

In approaching the human mind we must remember its phylogenesis; we must remember that the human mind comes through the human brain, the man brain, and that the man brain is the immediate descendant of the brute brain. If we wish to develop mind in a modern individual we must remember that mind has developed through the motor functions of the animal brain, through a process ages long. Our first concern is the brain; and, whether an individual *be born* subnormal, normal

or supernormal, we must have a knowledge of brain development before we can hope to understand his mind.

In the subnormal, in the feeble-minded, (feeble-brained might be a better term) it is doubtful if we have to do with mind at all, for, here, the manifestations are almost entirely motor. Being motor, the results will be motor; that is, the results will follow through reflex action, not through thought action. In the endeavor to help the feeble-minded the aim is to accelerate brain action; but we can hope for no great result in a brain whose development has been arrested. *The Past is inflexible and may not be advanced beyond its own limits.*

In the normal human brain much the same condition confronts us, but there is a difference. The motor function still dominates but it is not the only influence present. The man influence, the thought function, shows itself early. We have here an actively functioning brain following the normal course of human brain development. In this brain it is possible to appeal to reason, to bring the motor function and the thought function into close and intelligent cooperation. *The Present is flexible and may be moulded.*

In the supernormal individual, function is too rapid, and must be slowed down; the appeal to reason is just as necessary here as it is in the normal. *The Projection-Future, being over-flexibility, must be restrained within sound limits.*

AESTHETIC UNITY
AN INVESTIGATION INTO THE CONDITIONS THAT FAVOR THE
APPERCEPTION OF A MANIFOLD AS A UNIT¹

By MARGARET OTIS

The principle of unity is fundamental for any theory of aesthetics, for the harmonious union of the many in the one is necessarily involved in all aesthetic experience. The treatment of the aesthetic experience as an independent and fundamental life value is found presented by Münsterberg,² who places the inner agreement of meaning in the manifold as essential for the beautiful object. Aesthetic unity as thus understood is the subject of the present investigation, for it is a study of the inner agreement and disagreement of the various factors that go to make a work of art.

As a problem in experimental psychology the perceptive process is the one immediately concerned. In all our conscious experience we are constantly unifying various elements into wholes. Given a mass of lines, dots, or material of any kind, a selective process occurs and out of the mass groups are formed, the "higher units"³ of perception. The dot figure of McDougall⁴ well illustrates this process, also the lines and squares used by F. Schumann⁵ in his investigation of the process of visual perception. The problem of the attention is involved as in the interpretation of equivocal figures and puzzle pictures, for example, the six-pointed star of James⁶ that may be perceived as two superposed triangles, or as a hexagon with six small triangles, one attached to each side. Titchener⁷ refers to cases of puzzle pictures in discussing his theory of the two levels of attention.

¹The problem was suggested by the late Professor Münsterberg and was conducted in the Harvard Psychological Laboratory during the academic year 1909-1910. There were 7 subjects all of whom were either instructors or graduate students of psychology.

²H. Münsterberg: *Eternal Values*, 1909, chs. 9, 10.

³Cf. Ladd and Woodworth: *Physiological Psychology*, 1911, p. 597.

⁴McDougall: *Mind*, 1902, N. S. XI, 316.

⁵Schumann: *Beiträge zur Analyse der Gesichtswahrnehmungen*, *Zeitschrift für Psych.*, XXIII, p. 1.

⁶James: *Principles of Psychology*, I, 1890, p. 443.

⁷Titchener: *Psychology of Feeling and Attention*, 1908, p. 228.

Material of like character has been collected by various workers,

The method used in the present experiment depends largely for its effectiveness on just such possibility of a double interpretation of the figures concerned. A manifold is given from which the mind may select and interpret just as in the case of the equivocal figures. The manifold in this case consists of a number, usually six, small objects cut from cardboard. (Plate I, figs. 1-13.) These are arranged in various positions and combinations, and various possibilities of interpretation occur.

In regard to the relative merit of various figures such as the circle, the square, triangle, etc., some information has already been obtained. Fechner⁸ finds that the degree of unit that joins the parts of a circle is higher than that which joins the parts of a straight line and that unity between the parts of an ellipse is higher than that of the circle. Puffer⁹ discusses the forms found in use in the composition of pictures; pyramidal, diamond shape, diagonal, V shaped landscapes and square. She finds that the pyramidal is the commonest and the square less frequent. Gordon¹⁰ speaks of the triangle as the simplest of enclosed forms, the square as less concentrated, and the circle as the symbol of completeness. Some of the results of the present investigation have a distinct bearing on this question, the triangle and circle proving to be the best forms to be felt as units, in tests of varying character.

Such results are important for Aesthetics, yet our main problem has to do with the question of unity alone. The question of the pleasure derived from unity does not enter in. The subjects in the experiment were instructed to give a judgment merely as to whether a unit was apperceived or not, and the feeling, pleasurable or otherwise, though noted at times, was in no way the object of study.

Thus the purpose at hand is to study the process involved in the act of the mind by which a number of elements are unified into a whole, to ascertain what conditions favor and what hinder the formation of units, to investigate the power of various factors involved and to test their relative importance. This brings us to a description of the experiment itself.

The material used consisted of small objects cut out of cardboard in various shapes (Plate I, fig. 1-13). These are reproduced slightly reduced (one sixth) from actual size used.

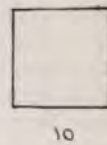
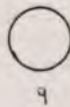
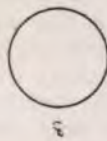
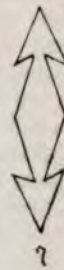
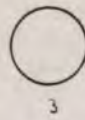
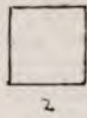
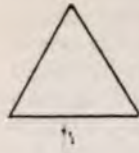
notably: Von Bezolt, *The Theory of Color*, p. 253, Wallace Wallin, *Optical Illusions of Reversible Perspective*, Mach. *Analyse der Empfindungen*, p. 164, Witmer, *Analytical Psychology*, p. 12 sq.

⁸ G. T. Fechner: *Vorschule der Aesthetik*, 1876, p. 53.

⁹ E. Puffer: *Psychology of Beauty*, 1905, p. 138 sq.

¹⁰ K. Gordon: *Aesthetics*, 1909, p. 166 sq.

PLATE I.



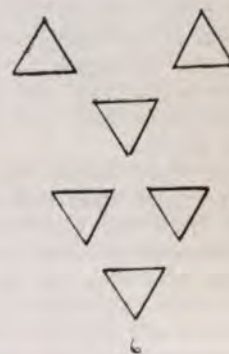
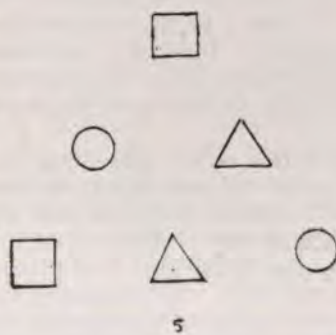
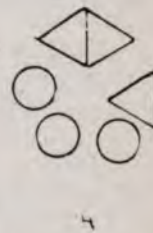
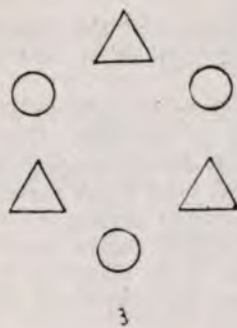
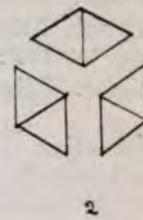
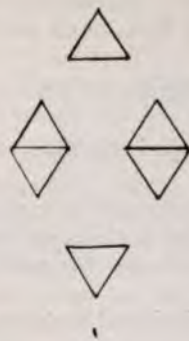
These objects, usually six in number, in some cases nine, were arranged on a black background in various figures within an area about 20 cm. square. (Cf. Plate II.) These figures were exposed by means of a tachistoscopic apparatus arranged as follows: The subject was seated before a black cardboard screen into which was fitted a diaphragm shutter with opening 3 cm. in diameter. On the other side of the screen was a cardboard surface also black, slightly inclined to the horizontal, and arranged to be in the field of view as seen by the subject, who had his eye at the opening of the shutter. The small pieces of cardboard were arranged on this surface. The figures were given an exposure of one-fifth to one-half second and the subject was asked to report in what way he apperceived the objects; whether they were united into a whole, or into subordinate groups, or whether they remained a manifold. The answer was recorded and the objects were rearranged. About thirty such exposures were given at one sitting, the arrangements of the objects being such as to throw light on some especial part of the problem. The objects used at first were white; later color was added, and in some of the final tests grey was used. The colors used were kept the same throughout, being red, green, blue, yellow, violet, orange, of the standard colors as given in the catalogue of Bradley. In one case only, two different shades of green, red, and violet were used. The time used was kept constant as far as possible. The shortest exposure was used at first for white objects on a black background. When objects of different shapes and colors were used, it was found necessary to give a longer exposure, and for the case where nine objects were used in relatively complicated figures a long exposure was needed. The influence of the time element, however, was considered only incidentally. In one case, only, the same figures were repeated using a longer time exposure. The object was to give sufficient time for the subject to be able to perceive the figure clearly, but not enough to allow him to study it, for it was desired to have merely the first impression recorded.

A unit as here used means not merely that the objects are felt as a whole simply because in the same field (the subjects were cautioned especially in this regard), but the individual parts must be felt as bound together, as belonging together in some way.

The factors investigated that have influence in the unit-making process are the following:

1. *Position.* The position or arrangement of the elements

PLATE II.



may give the character of unity to the group, such as a symmetrical arrangement, arrangement in a geometrical form as a circle or a triangle, arrangement in lines, or it may be that mere contiguity may give unity.

2. *Form*. Like forms such as triangles or circles may be grouped together.

3. *Color*. Like colors may be grouped together to form a unit.

4. *Direction*. Like direction has the power to make a unit, and certainly the direction in which the parts point has at all times a powerful influence, even if it is not the predominant one.

5. *Size*. The size of the elements is found to be important in its influence on the grouping.

6. *Association*. The binding principle may be association with some idea already in the mind.

Some of the terms used in the course of the experiment need to be defined as to their exact application, and are as follows:

The term *unit* is used when reference is made to a whole formed of all the elements present in the field. The term *figure* is used when reference is made to the arrangement of the elements used. The term *group* is used when some of the elements form the whole, the others being neglected or going to form another group. Thus six objects might form three groups composed of two each. The term *manifold* is used when the objects in the field are seen as individuals and are not grouped.

Groups may be formed determined by various factors mentioned above. Thus *color group* refers to a group determined by color. *Form group* refers to a group determined by the form of the component parts. A *position group* is determined by the arrangement of its elements. Similarly the terms *direction group* and *size group* are used when direction and size respectively are the predominant factors that determine the group.

It often occurs that the subject can report more than one experience upon looking at the figure exposed, that is, he may see it in one way first, and then another interpretation will flash upon his consciousness. A unit may be his first experience, and then the figure will appear to be split into groups. All such experiences have been recorded. In calculating the results and making up the tables the numbers refer to the first experiences, yet it often happens that a consideration of the

second experience is helpful. In some cases certain ways of interpreting the figures will occur only as second experiences. If a unit is reported as first experience by four subjects and as second by three, it would show that the unity of the figure was felt by all, though in a less degree by some.

Form. The first experiment consisted in using six equilateral triangles, white on a black background, arranged in various figures. The objects at first were all the same shape. The next step was to study the effect of using objects of two different shapes, three triangles and three circles; and later a greater diversity of parts was used, two triangles, two circles and two squares. See Plates I and II. The figures in which the objects were arranged were, first, a circle, then a triangle, a diamond, a rectangle, a figure called for convenience a divided hexagon, and a figure something like an arrowhead. Each figure was repeated five times, each time with a different combination of its elements, the first exposure showing all like parts, the second two different shapes, the third greater diversity in the elements and so on to the fifth exposure. The results are tabulated in Table I. The exposures are numbered one to five. The numbers under the words *unit*, *group*, and *manifold* show the number of times the figure was judged to be the unit, group or manifold respectively. The answers as tabulated show a decrease in unity when unlike forms are used as elements of the figure. The judgment would often be that the figure was a poor unit, so the distinction is made in the table between a good and a poor unit.

From these results it appears clearly that the effect of introducing different shapes as elements in the figures is to lessen the unity and at times to break it completely. The total number of cases of a good unity for all the figures when like forms are used is 28 out of a possible 42; that is, 66%, while in case of the same figure under like conditions except that unlike forms are used, the number of cases of good unity is only 18 out of a possible 168, or 10%.

We can also study in this series the comparative excellence as units of the figures used. Referring again to the table, we see that the triangle is a unit 32 times out of a possible 35, the circle 30 times, the diamond 21 times, the divided hexagon 16, while the arrowhead is a unit only 14 times, and the rectangle only 9 times. Of these figures with this time of exposure we can say that the triangle is the best unit, the circle next, both possessing a high degree of unity, the diamond comes not far behind, while the divided hexagon proves to be not so

good a unit because of the tendency to apperceive it as three groups. The arrowhead figure proves a poor unit, and the poorest unit is the rectangle.

TABLE I

Exposure					Circle					Exposure					Triangle				
		Unit Good Poor		Groups	Mani- fold			Unit Good Poor		Groups	Mani- fold			Unit Good Poor		Groups	Mani- fold		
1	7					1	6		1										
2	2	5				2		7											
3	2	3			2	3		5		2									
4	1	5			1	4		7											
5	1	4			2	5		6									1		
		30		5				32		3									
					<i>Diamond</i>										<i>Rectangle</i>				
1	6	1				1	2			2		3							
2		3	4			2	1	1				5							
3	1	2	4			3	1	1		5		1							
4		4	3			4	2			1		4							
5		4	3			5	1			1		5							
		21		14				9		26									
					<i>Divided Hexagon</i>										<i>Arrowhead</i>				
1	6		1			1	1	3		1		3							
2	3	3	1			2	1	3				2							
3	1	1	1	4		3		2				2	1						
4		2	5			4	1	2				2							
5			6	1		5		1				1							
		16		19				14		21									

Color. For the purpose of studying the effect of color six square objects were used of three different colors, two of each, in various combinations. These squares were arranged

to form the following figures: circle, cross, rectangle, a pyramid-shaped figure, triangle with apex below, and a monument-like shape with the parts contiguous. All possible combinations of the three colors were used. In general, color is found to have a decided influence on unity, but some figures keep their unity better than others. The comparative excellence of the above figures was found to be as follows, as is seen from Table II. The circle and cross are the best units, the monument next, the rectangle next, then the inverted triangle, and the pyramid-shaped figure the least unified.

TABLE II

	Unit	Manifold
Circle.....	27	6
Cross.....	27	6
Rectangle.....	17	15
Pyramid.....	8	24
Inverted triangle.....	15	16
Monument.....	24	7

Combinations of two colors were next tried. The same figures were used, formed of six squares as in the preceding experiment. The general result was that where colors were widely contrasting the figure would break up into two color groups. The subjects vary very much individually as to the influence of color upon their appreciation of form. The same general result as in the preceding experiment in regard to the unity of the different figures was found to hold. Only three cases of manifold were reported. The choice was usually be-

TABLE III

	Unit	Group	Manifold
Circle.....	16	18	1
Cross.....	21	14	
Rectangle.....	15	18	2
Pyramid.....	9	26	
Inverted triangle.....	18	17	
Monument.....	24	11	

tween a unit and two color groups. That there should be eleven cases of color grouping in the case of the moniment where the parts were contiguous is significant for the effect of color. See Table III.

Color Opposed to Form. In the next experiment three squares and three triangles were used and combinations of two colors, the division according to color and according to form not coinciding. The object was to see whether color or form was the stronger factor in determining a group. With the time used, one-fifth second, the result proved to be that color without question attracted the attention first, and judgments were uniformly given in favor of color groups. A longer time, one-half second, was given, and the same series of figures was used again without difference in the results as to appreciation of distinction in form. Some subjects reported that they did not notice that there were different shapes used, the impression being merely spots of color.

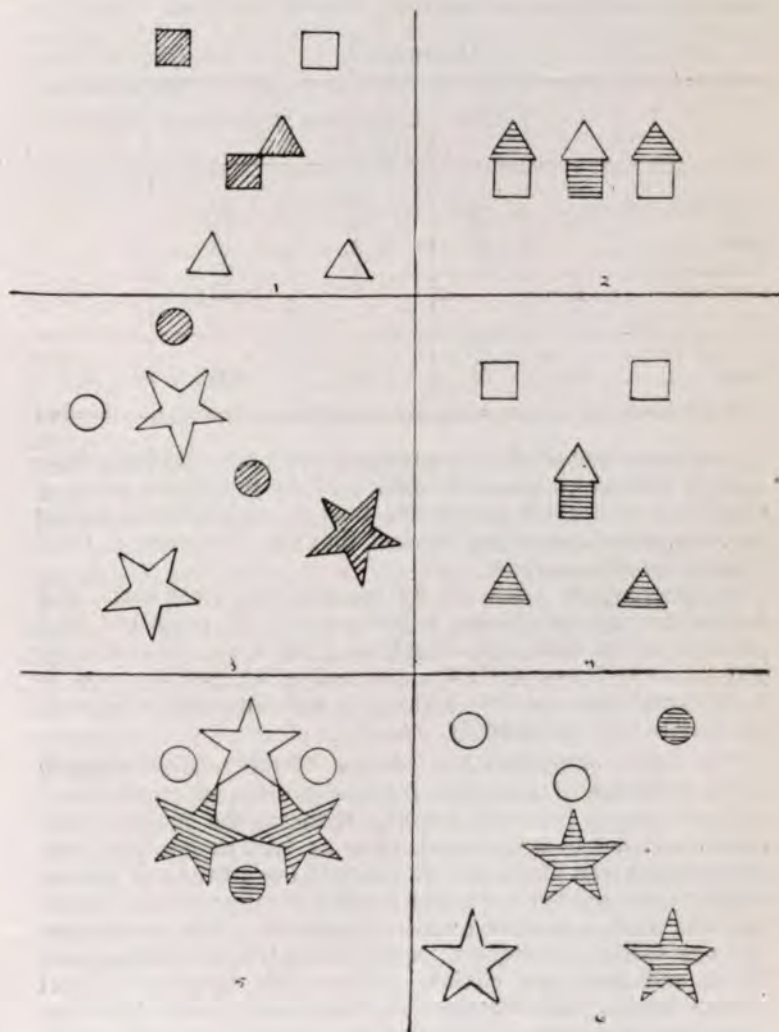
The effect of the longer time was to increase the number of units and color groups, and to decrease the number of cases of a manifold. In the first series, time one-fifth second, there were reported 51 units, 70 color groups, 16 manifold; with longer time, one-half second, there were reported 60 units, 85 color groups, 9 manifold.

As to the relative merit of the triangle and the circle the triangle was judged a unit slightly more often than the circle. In the first series the circle was reported a unit 24 times and the triangle 27 times; with the longer exposure the circle was a unit 29 times and the triangle 31 times. Contiguity proved a stronger factor than color when the arrangement was in three groups of two each. In the first series contiguity formed the group 28 times, color 10 times; with longer time, contiguity formed the group 25 times, color 13 times.

With the forms used in the preceding experiment it was found that even with long exposure the influence of color was stronger than the influence of similarity of shape. The difference between square and triangle was evidently not sufficiently great to have much effect in forming groups. In order to test the matter further a greater difference in form was sought and large stars were now combined with circles of smaller size. See Plate III.

Five figures were used: an irregular figure, called a butterfly by some of the subjects (Plate III, fig. 3), the circle, the cross, an hour-glass shape, and another irregular arrangement. Six different combinations of colors were used of varying contrast-

PLATE III.



ing power, and the arrangement of colors within the figures were varied. The combinations used were blue-yellow, violet-green, orange-red, green-yellow, red-yellow, and red-green. Time used was one-half second. For the result see Table IV.

TABLE IV.

	Unit	Form-group	Color-group	Manifold
Butterfly.....	3	10	27	2
Cross.....	22	3	17	
Circle.....	25	3	14	
Hourglass.....	14	3	22	3
Irregular.....		9	28	5
Total.....	64	28	108	10

The total number of form groups to the total of color groups is 28 to 108, which amounts to 80% of the judgments in favor of color. A decided preference thus is shown for grouping by color, notwithstanding the fact that the difference in form was made very marked.

By referring to Table IV we see that the circle is the best unit of the figures chosen, it being a unit 25 times out of a possible 42, the cross very nearly as good, a unit 22 times, the hour glass 14 times; while the irregular arrangements show no unity except that the first figure is a unit three times through association with a butterfly.

The Effect of Suggestion. A test of the relative strength of the influence of color and form of a different nature from the preceding is now introduced. Hitherto the subjects have been requested to keep their minds as free as possible from any preconceived ideas, and to maintain the attitude of passive attention throughout. At this point the influence of suggestion was made a feature of the experiment. The same material was used as heretofore; squares and triangles being combined, and stars and circles. (Plate III, figs. 3, 4, 5, 6.) Fifteen figures were arranged in which form groups and color groups were opposed. Color combinations used were the same, red-green, red-orange, red-yellow, green-violet, green-yellow, blue-yellow. The time used was one-half second. Before each exposure the subject was instructed that he would see

the figure in a particular way. At one time a form group was suggested and at another a color group, the whole number of each being the same. The form of the instruction was as follows: "You will now see two color groups, one red and one green," or "You will now see two form groups, a group of stars and a group of circles," and so on. The result of this experiment is given in Table V.

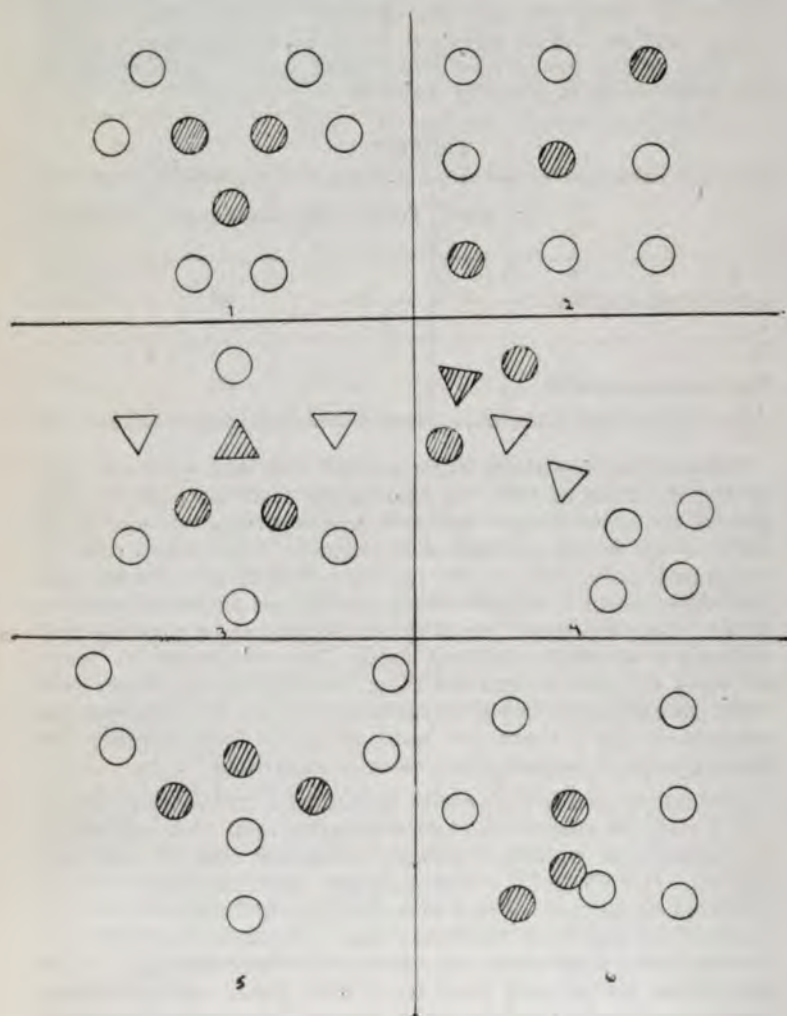
TABLE V.

	Unit	Form-group	Color-group	Manifold
Color-groups suggested. . .	6	10	89	
Form-groups suggested. . .	8	40	56	1

By studying the above table we find that when color is suggested there occur 85% of color-groups; when form is suggested the color-groups are still in the predominance, being 52% of the whole number of exposures; while when color is suggested, only 10% of the figures are seen as form-groups, and when form is suggested the number is increased only to 38%. This evidence seems quite conclusive in proving that color is a stronger unifying factor than similarity of form. A study of special figures (Plate III, figs. 4, 5) shows that some give color-groups preferably even when form-groups are suggested, while there are none to which a preference for form-groups is shown when color is suggested.

Form Opposed to Color with Increased Complexity of Material Used. A complication of the experiment was introduced by taking nine objects, variously combined into six different figures. See Plate IV. These figures were repeated on three different occasions. When presented the first time the objects were all of the same shape, circles. The next time two different forms were used, six circles and three triangles. The third time the objects used were four stars, three triangles, and two circles. On each occasion two colors were used, the division by color and the division by form not coinciding. The first figure (Plate IV, fig. 1) easily falls into three triangles, and for that reason is not so good a unit. The arrangement in a square, figure 2, proves to be the best for

PLATE IV.



holding so many parts together. The circle with inner filling, figure 3, proves to be not so good a unit as the circle unfilled, the increased complexity of the figure decreases its unified character, showing that simplicity is an essential for a good unit. In case of figure 4, though the axis of the balance is diagonal, yet it is one of the best units of the series. The holding power of the diagonal line is strong. Figure 6 is a combination of three distinct position groups. These have no connection with each other and thus the figure does not make a good unit. In the short exposure the arrangement of the three groups is hardly detected, and the judgment of a unit is given only where there is some association, as of a letter or sign. Figure 5 is one of the best units of the series, second only to the square, association with a Y helping the unity, the symmetrical arrangement also assisting. The number of judgments in favor of unity for the six figures respectively, throughout the three series of exposures, was: figure 1, 21; figure 2, 60; figure 3, 43; figure 4, 48; figure 5, 53; figure 6, 10. Therefore, arranged in order of excellence as units, we have figures 2, 5, 4, 3, 1, 6.

The effect of introducing different forms into the figures in the second and third series of exposures was to decrease the number of color groups, and to increase the number of cases of manifold. Units remain about the same notwithstanding the fact that the repetition of the figures in this way increases the chance of their being seen as a unit on account of their familiarity. The number of color groups in Series I, where circles alone were used, was 131; in Series II, where circles and triangles were used, it was 87; in Series III, where stars, circles, and triangles were used, it was 36. The number of form groups, with circles and triangles used, was 10; the number of form groups, with stars, circles, and triangles used, was 12. Thus, though the effect of introducing different forms into the figures is to decrease the number of color groups, still the total number of color groups exceeds the number of form groups. This is a confirmation of the fact already established that color is a more important factor than form in determining groups.

Direction. The next factor that makes for unity to be studied is the influence of the direction in which the component parts point. For this purpose six isosceles triangles were chosen with acute angle at apex (Plate I, fig. 5), all of the same color, gray. These were arranged in various figures, a triangle, rectangle, a V and V inverted, triangle inverted and

diamond. (Plate V.) At first, these triangles are made all to point upward, then downward, then to the right, then part up and part to the right, and finally part to the right and part to the left. This change of direction proves to have a very noticeable effect on the unity of the figure. The subjects were asked to discriminate between three degrees of unity; excellent, good and poor. The figures suffer a marked decrease in unity, according as the direction of the parts is changed. The results obtained by judgments on figure 1, Plate V, are given in Table VI. The other figures suffer a decrease in unity in like manner. The triangle with parts all pointing up (Plate V, fig. 1) is the best unit of all, all the subjects judging it an excellent unit.

TABLE VI.

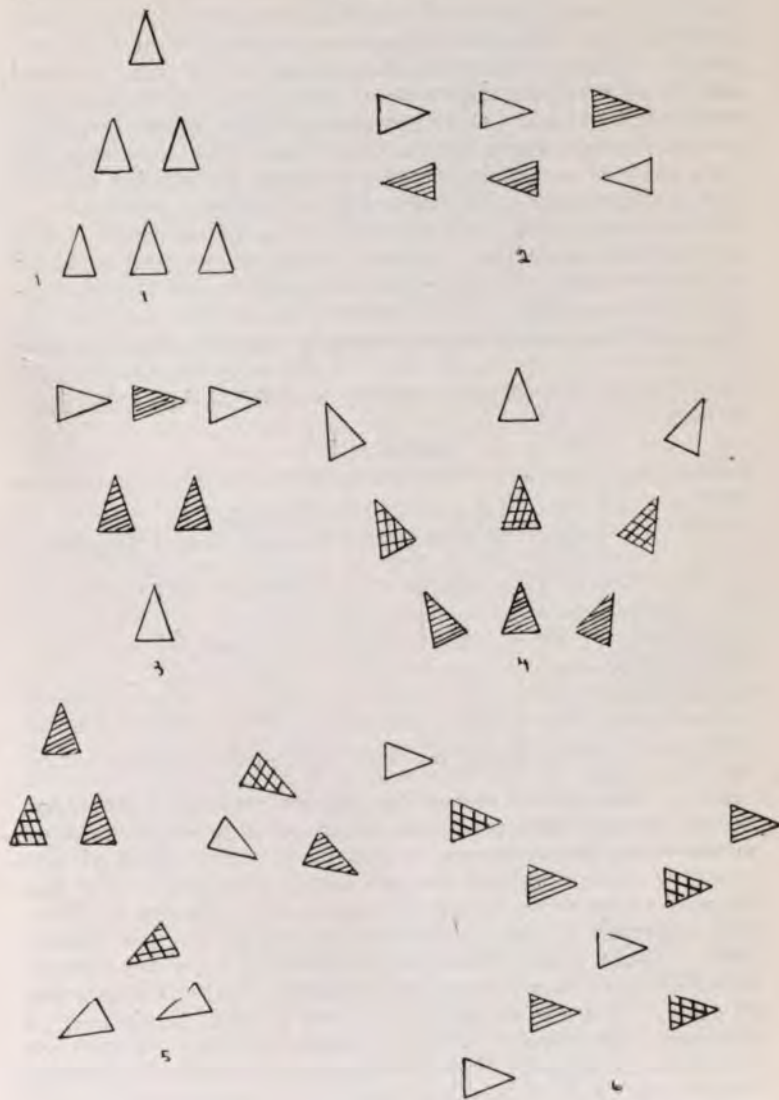
Direction of parts	Unit			Groups	Manifold
	Excellent	Good	Poor		
Up.....	7				
Down.....	3	1	2	1	
To right.....	1	2	2	2	
3 up and.....		2	2	3	
3 to right.....		2	3	1	1
3 to left.....					

Color Opposed to Direction. The preceding experiment was repeated with the addition of color. The combinations of colors used were red-green, orange-violet, blue-yellow, and red-yellow, the color being evenly divided among the objects. Color in this case is the more potent influence in determining groups, the number of color groups to the number of direction groups being 57 to 13. See Table VII.

Another experiment opposing color to direction was made, using more complicated figures, nine objects and three colors. (Plate V, figs. 4, 5, 6.) The color combinations were violet-red-green, blue-yellow-red, orange-green-blue, red-yellow-violet. The number of cases of manifold were noticeably increased, confusion being caused by the change in direction of parts and the number of the colors used. The number of color groups slightly exceeded the number of direction groups, 39 to 23.

To emphasize direction another experiment was made using as material triangles tipped with an arrowhead, and diamond-

PLATE V.



shaped objects tipped with arrowheads at both ends. (Plate I, figs. 6 and 7.) Six of these objects were used, three single and three double-direction, and two colors. The color combinations were red-green, orange-violet, blue-yellow, and red-yellow. Fifteen figures were used, and were then repeated with a different arrangement of the colors. Direction thus emphasized produced more groups than color, direction groups to color groups being 100 to 68. Fewer cases of unity and more cases of a manifold occur, inasmuch as both the distraction of color and of diversity of direction were present.

In general, color and direction were found to be fairly evenly balanced factors. Groups could be arranged to favor one or the other. Much depends on position and the arrangement of the colors. Color favored by position will prevail. Likewise when direction is assisted by position, direction prevails over color, as in the case of the arrangement in lines (Plate V, fig. 4), direction groups to color groups being four to two.

TABLE VII.

	Unit			Groups		Manifold
	Good	Medium	Poor	Direction	Color	
Six triangles, two colors...	28	45	44	13	57	22
Nine triangles, three colors...	15	42	33	23	39	59
Six arrowheads two colors...		2	8	100	68	22

Size. The relative size of the objects forming a group has heretofore not been regarded, all the objects in the field of vision being the same size or nearly so. The effect of size was now made a subject for investigation in itself. For this purpose circles were chosen to prevent any influence of direction inasmuch as the circle does not guide the eye beyond itself. Three large circles and three small ones were taken, all of uniform color, gray; this being to avoid the distraction of color. The size of the circles was 17 mm. and 6 mm. in diameter, respectively. (Plate I, figs. 8 and 11.) Time used was one-fifth second. Thirty different figures were presented, some symmetrical, some lines, some triangles, and some irregular. The result was more uniform than was the case with any other factor. The subjects seemed to be affected by size

in the same way and to the same extent. The three large circles were grouped together quite regularly and the three small circles also, even in cases where position would favor another grouping. Moreover, the group of large objects usually appeared first in order of time. The total of size groups perceived out of 210 exposures was 183, units 15, position groups 6, and manifold 6; that is, 87% of all ways of apperceiving the figures exposed consisted of groups according to size. Of these there were 49 cases of perceiving one group only, in which case the group was the one composed of the large circles. In 41 cases the large group was reported as being seen first and in 15 cases it was pronounced a better group or more prominent. Only in two cases was the group of small circles pronounced better, and in each of these the central position favored it.

A second experiment with size was tried in which nine circles were used, three sizes, 25 mm., 12 mm. and 6 mm. in diameter respectively. (Plate I, figs. 12, 3, 11.) The time used was longer, one-half second. The result corroborated the result of the preceding experiment. Groups were formed according to the size of the objects, 201 cases out of a possible 210, or 90%; only 5 cases of unity were reported, 3 position groups and one manifold. There were reported 87 cases of one group only, this being the group of the largest circles; 55 cases of two groups, consisting of the large and medium sized. Quite regularly there was a difference in time of apperception of the groups, the group of large circles being seen first, medium sized next, and smallest last. When two groups were apperceived, the large ones appeared first 44 times. The order of large, medium and small was reported 60 times, and the order of large, small, medium 8 times. In the latter case the group of small circles was usually in the center or some prominent position. The order medium, large, small was recorded once.

Color Opposed to Size. The material, figures and time were the same as for the first experiment with size, with the addition of color. The combinations of color were: red-green, blue-yellow, orange-violet, red-yellow, orange-green. There was a decided tendency for the formation of size groups rather than color groups. Of 190 exposures there were 147 cases of size groups or 81%, 9 cases of unity, 3 of position groups and 21 color groups. One group only, a group of large circles, was seen 46 times; and again, when both groups were seen, the group of large circles entered consciousness first. This

was reported 56 times, while the opposite order, small first and large next, was reported once in the case where the small circles outlined an outer triangle. It might be suggested that, inasmuch as size was the new feature introduced into the experiment, that might be the reason for its proving so powerful a factor. This consideration was outweighed by the fact that the series where size was opposed to color followed upon two preceding series where color had not been used, thus making color the additional feature of the experiment; so that novelty in itself can hardly account for the preponderating influence of size. Also, inasmuch as the subjects had been giving judgments of color groups for some time, it might be argued that this, if established as a habit, would influence their judgments in this case. Whether a new feature introduced or an habitual manner of apperceiving would be the stronger influence can hardly be decided, but the results would hardly be so uniform for all the subjects in case any uncontrolled influence were at work. The subjects were more unanimous in their response to the size factor than to any other in the whole series of experiments. Their susceptibility to color influence was markedly not uniform, and seemed to be quite an individual matter.

Form Opposed to Size. The material consisted of the large and small circles 17 mm. and 6 mm. in diameter, respectively; large and small squares, sides 15 mm. and 5 mm. respectively. The color used was gray. (Plate I, figs. 8, 11, 10, 13.) These were arranged in various figures. Size groups still predominated, though the percentage, 75%, was not so large as in the previous experiments. The number of position groups was slightly increased, being 19 out of 180 exposures. Units seen numbered 15, there were two cases of manifold, while only nine cases of form groups were reported. Again we find cases of the group of large objects seen first 13 times; and when both a group of large and a group of small were seen, the order in time of large, then small, occurred 78 times; the opposite order, small first, was reported once. For the most part the subjects reported that the difference in form did not particularly attract their attention, although at times it acted as a disturbing factor. Yet in the case of two subjects the squares stood out prominently contrasted with the circles. And of the 37 cases of form groups reported (and of these only nine were first experiences), there were 22 cases of one group only seen, and that the group of squares. One case of circles only occurred. Twice the order occurred of squares first, and then circles, when both were perceived.

Combinations of Different Sizes. The question arises as to just how much of a difference in size there must be in order to produce a marked effect in forming units. The combination of circles 17 mm. and 6 mm. in diameter, respectively, was effective, the difference in diameter being 11 mm.; also that of circles 25 mm., 12 mm., and 6 mm. in diameter, respectively, with difference of 13 mm. and 6 mm. The step was next taken to make the difference in size less in order to test the extent of its importance. Circles 17 mm., 12 mm. and 9 mm. in diameter respectively were used in three combinations: circles 12 mm. and 9 mm. in diameter, with the difference of 3 mm.; circles 17 mm. and 12 mm. in diameter, with the difference of 5 mm., and circles 17 mm. and 9 mm. in diameter, with difference 8 mm. Six objects, the same time, the same figures and the same combinations of colors were used as in the case of the preceding experiment where color was opposed to size. Only four subjects were available for this experiment, but the result was the same for all of them. The first combination of circles 12 mm. and 9 mm. in diameter, with difference 3 mm., produced no size groups, the subjects reporting that the difference in size was not noticeable, and accordingly color groups predominated. When the combination of circles 17 mm. and 12 mm. in diameter was used, the subjects reported that they noticed the difference in size, but it was not great enough, evidently, to act as a unifying factor, for here again no size groups occurred, and color groups predominated. But when the combination of circles 17 mm. and 9 mm. in diameter was used, with difference of 8 mm., size groups again appeared. The smallest difference in size, when size was effective, three sizes being used, was 6 mm. A difference of 5 mm. in diameter was ineffective, while a difference of 8 mm. produced size groups. The conclusion reached is that the difference in size, under the conditions of this test, must be at least 6 mm., and preferably 8 mm. in order that size might be effective as a unifying factor. Where the difference in diameter was 11 mm. there was no question of the effect of the element of size.

Summary. I. Position:¹¹ Contiguity makes for unity.

¹¹ Stratton considers that the interest in space form is more primitive than the sense of color. By form he means what we have here called position. He speaks of the "rivalry between the sensuous and the interconnective element," and shows that one or the other is subordinated. "If the attention is occupied with the color, the form and significance are in the background."

Stratton: *Experimental Psychology and Culture*, pp. 250 and 254.

Position assists form to overcome color. Position in a line has great power. Position throws the balance in favor of color or direction. Position as an opposing factor to size forms a group. Of the geometrical figures used the triangle and circle are the best units, the diamond and square next, lines are effective, the rectangle is good and other figures in varying degrees. This estimation is merely tentative. It seems to be justified by the tests that have so far been made. It might be that other conditions would bring out different results.

II. Form: Differing forms used within the figure disturb the unity. The effect also is to interfere with color grouping, and to produce a manifold. Similarity of form may determine a group, but this is, perhaps, the weakest of the factors studied, and it proves to be weaker than color. The influence of form was found to be also weaker than size.

III. Color: Color proves to be a strong distracting influence. Color is a stronger influence than form in determining groups. It is stronger than form even when suggestion is used to assist. Color and direction are nearly equal factors. Color is weaker than size as a unit making factor.

IV. Direction: Direction is a distracting influence and is able to break a unit. The power of direction is nearly equal to that of color, and when assisted by position may be stronger than color.

V. Size: Size is the strongest factor studied, when the difference in the size of the objects is made sufficiently great. Size is stronger than position, color, and form.

Analysis of the Process of Unification. In studying the influence of these various factors in the course of the experiment, it has been possible to observe the process of unifying. This process is not the same for all. Some minds are analytic while others may be called synthetic. The subjects have shown marked individual characteristics in their method of apperceiving. For instance, one subject will serve as an example of a pronounced synthetic type of mind. He shows the tendency to see the objects as individuals at first and to report a unit as a second experience. When questioned as to this habit, he said that the parts would persist in coming first, and the unit developed later. On the other hand, another subject illustrates the opposite tendency. A unit for him was the first experience in the majority of cases. The other subjects, while not as marked in type, exhibited many individual traits. Especially their susceptibility to color varied, three being ex-

tremely sensitive to the color influence, others not so much so, and one noticeably not influenced by it. This bears out the remarks of Stratton¹² in regard to the personal equation in the matter of form and color.

The processes of analysis and synthesis noticeable in the mental operations of the above-mentioned subjects may be found, the one or the other, in almost every judgment given throughout the experiment. It has been interesting to watch the influence of the various factors at work. We might say, in general, that the process in question is either destructive or constructive. A unit is seen and then is torn in pieces, or a manifold is seen and of the elements a unit may be constructed. Often the closing shutter would interrupt the process so that it was caught, as it were, half way, and the subject would report that he saw a unit, but that it was just about to break. A "tendency to break" was a frequent comment made when the force of the factor that was being studied, color, form, as the case might be, was not quite strong enough to prevent the unit and yet its influence was evident in consciousness. It seemed almost possible to measure the destructive tendency.

In studying the influence of the various factors at work, we find the following results: When two unit making factors are opposed to each other, the result varies according to the strength of the opposing elements, and it is possible to distinguish six different degrees of the influence of what may be termed the secondary factor. For one influence is usually the stronger and may be termed the primary or predominant factor, while the other is weaker and secondary.

1. The primary factor determines the group, while the secondary, though objectively present, does not enter the threshold of consciousness. This case occurs repeatedly. Many times when color and form were opposed, the subject would not be conscious at all that different shapes were used. Also when color and size were opposed, the difference in size being purposely made very slight, the difference of 3 mm. in the diameter of the circles was not noticed, and the subjects reported that the circles seemed about the same size.

2. The primary factor determines the group, while the secondary is just noticeable but is ineffective. In cases of unity determined by arrangement of the parts in a circle, colors used were apparent to the subject, but had no effect in disturbing the unity. Also where color was opposed to size, a difference in size of 5 mm. in the diameters of the circles was

¹² Stratton: *l. c.*, p. 251.

noticed, but did not have power enough to influence the grouping.

3. The primary factor determines the group while the secondary is not only noticeable but has a decided effect. It may have a destructive tendency. Its effect is to act as a disturbing element, though it has not power enough to break the unit. Many cases occur where color is reported as a disturbing element. Direction was felt to be disturbing many times, for instance, in the case of Plate V, figure 3, a medium unit was reported, but the effect of motion due to the direction was felt.

4. The effect of the secondary factor is constructive. The primary factor determines the group while the secondary draws into it an additional element. There are many cases of this constructive influence, for example, the case where large circles form the group while a small red circle was drawn in through the influence of color. The very act of including the additional element was seen in process in one case. The large circles made the group while a tendency to include a small orange circle was felt, but the process was not completed. Three circles made a group determined by form, while a large square was added because of its size.

5. The factors may be evenly balanced in power and as a result cases of fluctuations or rivalry occur. In these cases of rivalry one or the other of the forces may win out and determine which group is to be apperceived; or a confusion arises, neither winning, and a manifold is then reported. Cases of rivalry between form and color occur, as in the case of Plate III, figure 3, and many others. Sometimes color wins out, sometimes the fluctuation persists and sometimes confusion results. There are cases of rivalry between direction and color, as Plate V, figs. 4, 6. In the case of Plate V, fig. 6, the conflict results in a manifold. In one case the process of grouping by color was actually interrupted by a sudden perception of direction groups. A size group and a position group were seen, while the rival tendencies of size and color produced a disagreeable feeling tone.

6. The primary factor determines the group when the power of the secondary factor suddenly increases, acts destructively, and causes confusion and a manifold results. A number of cases occurred where a unit was reported as a first experience and a manifold as a second. This shows just such an operation as described. The influence of color is often found to act in this way. A poor unit was reported as a first experience, then two groups as a second, and finally the disintegra-

tion was completed and a manifold was the result. The feeling of confusion often accompanied such an experience.

The data upon which these results have been based are too few to permit final conclusions upon all the points involved, but they have been presented for the suggestions they offer and should prove of value not only for theoretical aesthetics, but also for practical purposes especially in the fine arts, decorative art, and advertising.

SOME VARIABILITIES AND CORRELATIONS IN LEARNING

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This paper reports an investigation of the following problems: To what extent are the first performance and other early performances measures of succeeding performances? Does practice make an individual's performance more consistent? Does practice make individuals of a group more like one another in their performance? What is the relation of card-sorting to intelligence? What is the relation of gain in card-sorting to intelligence?

Twenty-seven normal school students sorted cards for 25 seconds, 20 successive times during a period of 50 minutes. This was repeated by the same subjects after ten days, then one day later and finally after an interval of three and a half months. Fourteen other subjects fitted 36 cubes, each of whose faces had a separate color, into a box, for 23 successive school days. Of these 14 subjects, 7 knew the time record after each performance, whereas the other 7 at no time during the experiment knew any of their time records.¹ Sixteen of the card-sorting subjects, who had worked together in the same group in all classes for a term, ranked one another in general intelligence.

To what extent is the early performance the measure of succeeding performances?

On the basis of the median of each successive five performances in card-sorting the one class of 16 subjects, the other of 10, were ranked.²

Correlations between the early ranks and the succeeding ranks, and between the final ranks and others, were then determined. Similar data were derived for the colored cube test. Table I gives these correlations. Considering the two groups for card sorting (A) there is practically no difference between those with the first five and those with the last five. For the color-cube test there is no difference worth mentioning

¹ Hazel Coburn, Helen Collins and Garry C. Myers. Some Studies in Learning. To appear shortly in *School and Society*.

² To simplify computation only ten (chosen alphabetically) of this class of 11 were considered.

except in the not-knowing group, where the advantage is decidedly in favor of the correlation with the first five, i. e., in this case the ranking for the average of the first five performances are more like all the succeeding rankings than is the ranking for the average of the last three like all the other rankings. The "not-knowing" group toward the end had less incentive to do their best than the "knowing" group.

Similar data are shown below table (C) from 14 girls, who, learning to use the typewriter, practiced on the same sentence for 3 minutes per day for 25 successive school days. Seven of them emphasized accuracy; the other seven speed. Those who emphasized accuracy tended more to keep the same relative rank throughout than those who emphasized speed. Apparently, then, the learner's knowledge of his rate of speed and his aim to be rapid even at the sacrifice of accuracy tend to increase shifting of relative ranking of individuals within a group.

TABLE I.
C. TYPEWRITING

	With First		With First Five		With Last Five	
	Accuracy	Speed	Accuracy	Speed	Accuracy	Speed
First five...	.82	.93	1.00	1.00	.18	-.04
Second five..	.57	.31	.89	.43	.86	.25
Third five...	.29	.13	.68	.30	.93	.43
Fourth five..	.13	-.04	.47	.00	.84	.70
Fifth five...	.18	-.04	.64	-.11	1.00	1.00

In card sorting, the correlations with the second five, however, which is about the same as with the seventh five, gives far better results. The initial single performance does not measure very closely the succeeding ten performances. For example, for the 16-group it correlates with the second single performance .71; 3rd, .55; 5th, .60; 10th, .65; and the fifth with the 10th, .76. The correlation of the initial trial with the median of the first is +.73 and for group 10 it is +.83.

The 10-group have considerably higher correlations, i. e., the relative ranking at any one point on the whole, more closely agrees with all other rankings than for the 16-group. This is significant from the fact that the larger class is a highly selected one, being made up of the best of a class of over 100 whereas the other class is one of the regular sections of the same class.

TABLE I.
CORRELATIONS
BETWEEN DIFFERENT STAGES OF PERFORMANCES
A. Card Sorting (26 subjects)

Successive Five Trials	Class of 16			Class of 10		
	With First Five	With Second Five	With Seventh Five	With First Five	With Last Five	With Last Five
1.....	1.00	.75	.53	1.00	.53	.53
2.....	.75	1.00	.72	.94	.80	.80
3.....	.63	.90	.64	.81	.86	.86
4.....	.65	.89	.72	.95	.83	.83
5.....	.31	.65	.84	.94	.80	.80
(10 days interval)						
6.....	.38	.76	.85	.90	.78	.78
7.....	.53	.72	1.00	.92	.67	.67
8.....	.29	.61	.84	.76	.77	.77
9.....	.35	.60	.70	.75	.80	.80
(1 day interval)						
10.....	.32	.65	.87	.86	.86	.86
11.....	.32	.71	.85	.66	.80	.80
12.....	.51	.71	.82	.67	.83	.83
(3½ months interval)						
13.....	.31	.42	.41	.54	.56	.56
14.....	.24	.49	.35	.53	1.00	1.00
Average.....	.47	.70	.72	.79	.78	.78

	Class of 16	Class of 10
4th with 5th trial.....	.71	.89
8th with 9th trial.....	.86	.70
12th with 13th trial.....	.39	.60
1st with 1st five trials.....	.73	.83

TABLE I.

B. Colored Cubes

	Subjects not knowing rate	Subjects knowing rate	Subjects not knowing rate	Subjects knowing rate
	First five with		Last five with	
Second five.....	.71	.98	.86	.13
Third five.....	.79	.37	.86	— .03
Fourth five.....	.84	.40	.89	.45
Last three.....	.86	.13	.82	.28

On the other hand the discrepancy seems to be explained largely by the fact that X of group 16, who ranked lowest in her first five, reached the highest maximum record for the class on her 60th trial and fell to the 11th place in her last five trials. Her relative positions by fives throughout are 16, 13, 11, 11, 4, 2.5, 4, 3, 3, 3.5, 2.5, 4, 13, 11.5. No other such record was found in this or the other group.

Apparently, for card-sorting at least, the first five trials are about as representative of all the others as are the last five.

Putting the problem in another way. *To what extent do the performers maintain their relative rankings throughout?*

Table below shows that of class 10 those who were in the lower half of the group at the start remained there as a rule. In only 8 of the 14 series of 5 were there exceptions and there only one case per series. The shiftings were limited to 4 persons. The letters in the second row indicate individuals of the lower half who shifted to the upper half on the respective trials.

Rank (in series of five)...	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Shifts from 2nd to 1st half -	B	K	-	-	-	C	C	K	-	K	K	O	-	-

Excepting the one "abnormal" case, of class 16, similar consistency in ranking obtained throughout the periods of performance.

By reference to the table of correlations between the rankings at various points in the curve of practice, one sees there strong evidence that, as a rule, the individuals tended to maintain the same relative position throughout. This is a bit more evidence of original nature.

Thorndike found a Pearson coefficient of .48 between first and last performance in addition. Those who start out best come out best after a moderate amount of practice. His 10 individuals who led at the beginning gave at the close of the hour 23.5 examples per hour; next 10 gave 20.0; remaining 8 (lowest) only 11.1.³

In a similar experiment in addition by 4th grade children Thorndike found that those who start out best come out best.

Wells by addition and cancellation tests found on the whole the same relative position before and after practice.⁴

Hollingworth (*Vocational Psychology*, Ch. XI) put each of 13 individuals through 205 repetitions of seven different mental tests, 5 trials, at 2½ hour intervals, made daily. Corre-

³ Variability between Individuals. *Amer. Jour. Psychol.*, 1908, 19: 374.

⁴ *Amer. Jour. Psychol.*, 1912, 23: 75.

lating the ranking of the subjects in trials 171-175 with that of the first trial, with the median of trials 1 to 5, of 20 to 25, of trials 46 to 50, of trials 76 to 80, and of trials 126 to 130, he got for the 13 tests, average correlations of .41, .61, .73, .77, .85, .92, respectively. Hollingworth concludes: "It is at once evident that the preliminary trial is by no means always a measure of the final relative capacities of the individuals tested. . . . As the trials proceed, then, the relative positions of the thirteen individuals became more and more definitely fixed, but in the beginning the indication is obscure."

Forthwith Hollingworth calls into question the reliability of determining an individual's capacity on the basis of one or a dozen trials at tests, and he states that in case numerous trials are not expedient, only those tests should be used whose results in initial performance correlate very highly with the performance after a very large number of trials. For real diagnostic value he has the conviction that "we shall find it necessary to determine the individual's limit of practice in the various tests before we shall secure diagnostic results which will be verified by the individual's subsequent achievement in daily life."

Certainly the desirability of determining the individual's maximum capacity in any test is undoubted. Hollingworth's assumption, however, that the 171-175 trials represent the highest capacity of the subjects may be questioned. His results merely measured what the individuals *did* on those trials. The learning curve in card-sorting reported elsewhere clearly shows that when on the twentieth trial of the two days the writer told the subjects that it was the last and urged them to do their very best they made a decided spurt considerably above their highest record. This the writer has invariably found for several terms with the card-sorting test used as a regular class experiment. Several performers said they could scarcely drive themselves to the task on the third day's performance because of the monotony of the task. Suppose they had repeated the task 200 times. Even then a "desirable prize" at the end would not, perhaps, say on the 100th trial, be much more incentive to work their very best than would a promise of heaven at 80, be an incentive to a boy of 10, to be good.

In a study of Rivalry the performer, in spite of himself, tended to vary with his rival.⁵

⁵ School and Society. To appear shortly.—Hazel Coburn, Helen Collins and Garry C. Myers.

Morgan's⁶ study of lifting unseen weights well shows that what a subject does is not a certain measure of what he can do. Adaptation to drudgery, attitude, susceptibility to motivation and willingness to keep at the job, naturally would become more effective factors after many trials than in the early stages of the race. Perhaps the later trials measure these factors rather than mere capacity to do the work.

The fact that those subjects who knew their own and one another's rate of progress shifted relative rankings in the group far more than those to whom all rates were unknown, suggests factors at work other than mere capacity for the task. Indeed it is pretty safe to assume that all other things being equal the performer works the hardest at or near the outset of a task.

yes 2 (Had Hollingworth correlated the first or fifth trial with each of the others he would have found a descending instead of an ascending correlation. A much better case he might have made, too, could he have shown that on the 130th trial the subject's ranking in the tests correlated more closely with their intelligence than did their 1st or 5th trial. The writer computed such correlations for card sorting in class 16.

CORRELATION OF INTELLIGENCE WITH

Initial performance.....	— .14
Median first 5.....	+ .13
Median fourth 5 (End 1st day).....	— .29
Median eighth 5 (End 2nd day).....	+ .07
Median twelfth 5 (End 3rd day).....	+ .18
Median fourteenth 5 (Final five).....	+ .07

These correlations, all of which practically fall within the P.E., reveal no definite change with practice.

What then is the *relation of card sorting to intelligence?*

The initial average record per 25 seconds for the group 16 which is a marked ability class selected from among about 100 students, is 22.8 cards; average of the 1st 5, 26.9. For class 10 (a regular class) the corresponding figures are 21.8 cards and 27 cards. The initial performance of the 8 ranked highest for general intelligence (class 16) was 20.7 cards, of 8 ranked lowest 28.1 cards.

From these data and from the above correlations there seems to be no relation between general intelligence and card sorting ability.

⁶ The Overcoming of Distraction and Other Resistances. Archives of Psychol., No. 35, Science Press.

What is the relation of highest gain in card sorting to general intelligence?

The greatest gain by class 16 was 105 per cent. ; by class 10, only 94 per cent. (The highest record appeared from the fourteenth trial upwards.) The gain of the last or 70th performance over the first was for class 16 (of marked ability), 76 per cent.; class 10, 61 per cent. The 8 best in general intelligence gained 129 per cent.; the 8 poorest, 81 per cent. On the last trial, the gain per cent. by the 8 best and 8 worst was, respectively, 94 and 58. The gain of the average of the last five trials over the average for the first five is, for class 16, 30 per cent.; for class 10, 20 per cent. The greatest gain and the gain on the last trial correlated with intelligence, $+.48$ (P.E. .129) and $+.34$ (P.E. .149), respectively. Between the highest gain for the 70 trials and the highest gain for the first 20 trials there was a correlation of $+.66$ (P.E. .095). Doubtless, then, a very certain test of intelligence is the capacity to gain. Whereas with the actual performance there was no relation to intelligence, but at the same time a good positive correlation with gain in performance, a problem of good promise would be to determine how much the relative correlation with gain would be changed if the performance per se were a strong measure of intelligence.

Colvin⁷ found a similar measure of intelligence.

Five normal children were paired with 5 subnormal children of the same mental age and given the Cancellation (a) test. "A comparison of the learning curves showed that in every case the normal child made greater improvement with less fluctuation than did the subnormal child."

Later Strong found that whereas 4th grade normal children in 14 days' drill of 2 minutes, advanced from 38 simple addition combinations to 66 such combinations, a class of defective children of the same age but still in the 2nd grade advanced only from 7 to 14 such problems. He concludes that the shape of the curve base on simple arithmetic performance correlates considerably with general intelligence.⁸

Does the performer who attains the highest maximum tend to gain most?

Class 16 were ranked on the basis of their maximum single performance regardless of the trial in which this performance occurred and in like manner on the basis of the greatest total

⁷ Notes on Certain Aspects of Learning. As determined by the Binet Tests. *Psychol. Bull.*, 12, 1915: 67-68.

⁸ The Learning Curve as a Diagnostic Measure of Intelligence. *Psychol. Bulletin*, 1917, 14: 153-154.

gain per cent. These two rankings correlated $+.57$. The average gain for the 3 performers who attained the highest maximum records was 50 per cent.; for the 3 who attained the lowest maximum only 21 per cent. The question, then, is answered affirmatively.

Does the performer who reaches the highest point tend to end best?

The ranking of the maximum performances with that of the 14th or last five-group correlates $+.64$. Again there is an affirmative reply.

Does the performer who reaches the highest point tend to start best?

The correlation between the rankings in question here is $+.43$. It would seem, therefore, that the final performance is a better measure of the maximum performance (last five) than is the initial (first five) performance. The difference, however, is negligible in the light of the exceptional mode of performance by X noted above. The correlation for the other 15 performers is $+.79$.

Do individuals of a group become more or less alike with practice upon the same work?

Here all 27 subjects were studied. The M. V. of the several subjects from the average, for each succeeding performance was obtained. Then the median of each succeeding group of 5 M. V.'s divided by the median of the averages for these respective groups was considered the measure of variability among the performers. These 14 succeeding ratios are: .11, .13, .12, .14, .11, .14, .11, .12, .13, .16, .14, .14, .13, .14. Likewise the variability for cube fitting, among the several individuals for the 23 successive single trials divided by the average was as follows:

RATIO OF M. V. (FROM AVERAGE FOR EACH SUCCESSIVE PERFORMANCE)
TO AVERAGE PERFORMANCE FOR EACH TRIAL

Trial	1	2	3	4	5	6	7	8	9	10
When subjects knew .....	.08	.13	.14	.13	.13	.11	.10	.08	.10	.12
When subjects did not know	.12	.13	.12	.12	.10	.07	.11	.12	.13	.10
Trial	11	12	13	14	15	16	17			
When subjects knew .....	.21	.09	.12	.10	.11	.07	.12			
When subjects did not know	.15	.09	.09	.09	.11	.09	.11			
Trial	18	19	20	21	22	23				
When subjects knew .....	.07	.09	.08	.09	.15	.13				
When subjects did not know	.12	.09	.10	.15	.12	.12				

Thorndike⁹ in like manner found about the same ratio of M. V./Ave. at the beginning and end of practice in mental multiplication of one three place number by another.

From these data one cannot say whether practice makes individuals more or less alike.

Does an individual become more or less consistent with practice?

The group of ten were studied on this point. Each individual's records were studied in series of 5 records. The variability was computed from the median of each successive 5 trials and the M. V. was derived; this divided by that median was the chosen measure of variability. The averages of these ratios by the class for the successive 14 fives are: .085, .044, .048, .049, .047, .052, .037, .055, .051, .033, .041, .050, .049, .053. Although there is a drop from the first five to the second five, thenceforward there is no appreciable loss or gain in individual variability. Therefore it seems that whereas the individual becomes a little more regular in performance after a few trials this regularity is not improved by further practice. Furthermore, influence on variability by the length of intervals between test days is not at all revealed by these data.

In this respect Woodworth (Mimeographed Notes, p. 19) points out that while, to ordinary observation, practice makes an individual more regular Ruger's data on puzzle solving suggest uncertainty on this subject. On the other hand Hollingworth speaks of decreased individual variability with practice for his subjects. (Vocational Psychology, p. 251.) Certainly more data on this point are desirable.

For the 10-group the ranking for the greatest gain per cent. correlated with the ranking in smallness of variability gives —.28, P.E. .20. Apparently then there is no relation between regularity of the performer and his degree of progress, as applied to card-sorting.

CONCLUSIONS

1. The relative ranking of individuals of a group working at the same task over a long period of time, tends to remain pretty generally the same. The first five performances are as good measure of the remaining 13 five trials as are the last five trials of all others. After a few trials there is no certainty that any performance more definitely measures capacity than any other. Native capacity is pretty strongly evidenced.

⁹Amer. Jour. Psychol. 1908, 19: 374.

2. There is practically no correlation between card sorting and intelligence, at any stage in the series of practices.
3. The correlation of the highest gain in card sorting, with intelligence, is $+.48$.
4. There is a positive correlation
 - a. Between maximum performance and maximum gain ($+.57$).
 - b. Between maximum performance and final performance ($+.64$).
 - c. Between maximum performance and initial performance ($+.43$).
5. Practice does not make the individuals more or less alike.
6. Practice after the first few trials does not make the individual a less regular performer.
7. No correlation obtained between regularity and gain in performance.
8. Doubtless one or a few trials in the average mental test is about as good as an infinite number of trials.

MINOR STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF VASSAR COLLEGE

XXXIV. A FURTHER STUDY OF FRESHMEN

By MARGARET MONTAGUE, M. M. REYNOLDS, and M. F. WASHBURN

In this JOURNAL for January, 1917, a report was made of the results of a questionnaire investigation and of certain tests applied to Vassar Freshmen of the class of 1918. The same questionnaire has been used for succeeding Freshmen classes, and tests have also been made, some of them identical with those used on the Class of 1918, others different. The present paper will give a brief statement of certain results from the classes of 1919 and 1920.

For the class of 1918, correlations by the presence and absence method were calculated from the answers to the questionnaire.

(1) It was found that "a slight negative correlation ($-.21$) appeared between interest in mathematics and fondness for writing." For the class of 1919 this negative correlation was larger ($-.38$), and for the class of 1920 larger still ($-.51$). In both cases the size of this coefficient is due chiefly to the large class of individuals who say they dislike mathematics and like to write. Thus the chances are about even, in both 1919 and 1920, that a person who likes mathematics will like to write (40:38 in 1919, 35:32 in 1920); they are one to three (35:108) in 1919 that a person who likes to write will like mathematics, and one to two and a half (40:99) in the class of 1920. They are almost exactly even for both classes that a person who dislikes writing will like mathematics (42:38 for 1919, 32:32 for 1920). Thus it seems clear that the proportion of students who say they dislike to write but they like mathematics is decidedly greater than the proportion of those who say they like to write and like mathematics.

(2) For 1918, "a slight negative correlation ($-.18$) obtained between enjoyment of poetry and fondness for manual work," according to the questionnaire replies. For 1919, this coefficient is also negative ($-.76$), but for 1920 it is positive (.43), and in both cases it is without significance because the number of those who like both poetry and manual work is so much greater than that of those who dislike both.

(3) As for the class of 1918, so for 1919 and 1920, no correlation was found between interest in science and a tendency to observe one's surroundings.

(4) For 1918, "The highest positive correlation, one really significant, obtained between the claim to accurate verbal memory and the possession of oral fluency in recitation. It was .41." That is, this was the correlation between the numbers of students who in response to the question, "Can you readily remember the exact words of anything heard?" answered "Yes," and those who in response to the question, "Do words come to you readily, or with especial difficulty in an oral recitation?" answered "Readily." This positive correlation was confirmed for 1919 (.54), and for 1920 (.45). The distribution

of cases was as follows. In both 1919 and 1920, of those who claim accurate verbal memory, from two to three times as many say they are fluent in oral recitation as say the contrary. In both 1919 and 1920, the number of those who say they are not fluent in oral recitation and confess to poor verbal memories is three times that of those who are not fluent but have good verbal memories. On the other hand, the ratio of those who admit poor verbal memory but claim fluency in recitation, to those who admit poor verbal memory and lack of fluency, is more nearly unity for both 1919 and 1920 (53:69 for 1919, 67:79 for 1920). And the ratio of those who say they are fluent in recitation and have accurate verbal memories to those who say they are fluent but have poor verbal memories is also not very far from unity (60:53 for 1919, 67:48 for 1920).

(5) No significant correlation appeared between the answers to the questions, "Do you work better in the morning or the evening?" and "Can you readily turn from one task to another."

On the whole, the answers to the questionnaire thus presented to three Freshman classes give ground for the following statements:

A student who reports that she dislikes to write is much more likely to say she is interested in mathematics than is one who reports that she likes to write.

A student who says she has accurate verbal memory is much more likely to say that she is fluent in oral recitation than is a student who admits a poor verbal memory.

A student who says she is not fluent in oral recitation is much more likely to say that her verbal memory is not accurate than is one who claims fluency.

We have also some data to report concerning certain tests.

(1) The test of verbal memory used for the class of 1918 (the Cicero passage, Whipple, volume II, page 209, read aloud to the observer) was used for the classes of 1919 and 1920. The testing was as for 1918 done by about thirty students, members of an advanced class in psychology, but all the testers had carefully prepared written directions and gave no instructions to the subjects except such as were supplied them on the direction papers. The results of this test were as follows: For 1919, average 37.2 words, highest score 79, lowest 12, S. D. 13. For 1920, average 37.1, highest score 84, lowest 12, S. D. 12.5.

The relation between this test and academic performance in the Freshman year was studied by finding the average academic grades of the students who fell in the highest quartile according to the test, and the average for those who fell in the lowest quartile. The highest possible grade for the Freshman year being 90, the average grade for the highest quartile was, in 1919, 58.3; in 1920 74.2. The average grade for the last quartile was in 1919, 42.3, in 1920 51.4. Thus the difference in grades was for 1919 16, for 1920 22.8.

In the autumn of 1917, the beginning of the senior year of the class of 1918, we calculated the average class standings for three years of the members of 1918 who had fallen in the first and last quartiles of this test. The difference was found to be only 21.8 in favor of the first quartile, or about ten per cent of the average standing of the last quartile. This difference was somewhat less absolutely than the corresponding difference in 1918's Freshman year, which was 24; it was of course much less relatively.

At the same time, we determined what per cent of students in the

first and last quartiles respectively had withdrawn from college for any cause whatever. 26.6% of the last quartile had withdrawn; 19% of the first quartile: a difference of 7.6% in favor of the first quartile.

(2) For the Cicero passage as a test of memory for ideas the scores were:

For 1919, average 25.8 ideas, highest score 61, lowest 8, S. D. 10.2. For 1920, average 24.5 ideas; highest 49, lowest 6, S. D. 8.

The difference between average academic grades of the first and last quartiles was, for 1919, 13; for 1920, 17.8.

(3) For the Reading Backwards Test, the scores were:

For 1919, average, 368.2 seconds; quickest score, 135"; longest, 1029"; S. D., 84. For 1920, average, 324.9 seconds; quickest score, 121"; longest, 685"; S. D. 77.

The difference between the average Freshman records for the first and last quartiles was, for 1919, 12.9; for 1920, 16.4.

An examination of three years' academic records for the class of 1918 showed a difference of 22.1 points between first and last quartiles in this class. This was only a few points larger absolutely than the difference between the Freshman records of these two groups, which was 19 points, and of course it is much smaller relatively.

Of the students in the last quartile of the Reading Backwards Test in the class of 1918, 35% withdrew before the beginning of their senior year; of those in the first quartile 19.4% withdrew; a difference of 15.6%.

(4) The Hard Directions Test, which was used with the class of 1918, was reported as giving the smallest difference between the academic grades of the first and last quartiles in the Freshman year. It was not used on 1919 and 1920. Examination of the three years' academic records of 1918 showed that this test was decidedly below either the memory tests or the Reading Backwards Test as a prophet of academic success. The difference between the average grades for three years of students in the first and last quartiles of this test was only nine points. Further, of the students in the first quartile 32.6% withdrew before the beginning of the senior year, while of the last quartile only 26.5% withdrew, a difference of 6.6% in favor of the worst quartile.

(5) A test of suggestibility was given to the Freshmen of the class of 1920; namely, the picture of the Butcher's Shop, with the questions used by Healy and Fernald.

The average number of suggestions resisted out of 10 was 8.9; the highest number of course 10, the lowest 3, the S. D. 1.2. The average academic grade for Freshman year of the first quartile was 58.7; for the lowest or most suggestible quartile it was 61; a difference negligible in amount.

(6) The Freshmen of the class of 1919 were given a free association test, with the first fifty words of the Kent-Rosanoff series, the number of egocentric reactions according to the categories laid down by Wells¹ being counted. There was found to be practically no difference between the academic grades of the quartile showing most egocentric reactions and that showing fewest.

(7) The Thurstone Reasoning Test A was given to the Freshmen of the class of 1920. The scoring was done in terms of the average time for correct criticism of a single argument. The average time

¹*Psychological Review*, volume 18, pages 329-333.

was 29.8 seconds, the quickest time 10.3 seconds, the slowest 81.6 seconds, the S. D. 11.8 seconds. The average Freshman grade of the best quartile in this test was 67; that of the poorest quartile was 51.8: a difference of 15.2.

(8) In the class of 1918, of those in the first quartile in *two or more* tests (21 persons), 15% withdrew before the beginning of senior year. Of those in the last quartile in two or more tests (16 persons), 40% withdrew.

From these results it appears that:

(a) Both the verbal memory test and the Reading Backwards Test are better than the Hard Directions Test as an index of probable academic success. The Hard Directions Test is no index at all.

(b) There is no relation between academic success and suggestibility (as shown in the recall of details of a picture), or tendency to make egocentric reactions in a free association experiment.

(c) The relation between success in Freshman tests and academic success in three years work is decidedly less than that between success in Freshman tests and academic success in the Freshman year. Since this statement refers to groups, that is, to first and last quartiles, rather than to individuals, one reason for the difference is clearly that more of the last quartile than of the first quartile withdrew before completing three years of college work, so that the groups compared at the beginning of senior year are less nearly equal in size and probably more nearly equal in ability.

(d) Failure to get above the lowest quartile in two or more Freshman tests indicates nearly equal chances that the student will withdraw before the beginning of senior year.

XXXV. FURTHER TESTS OF THE VERBAL ABILITY OF POOR SPELLERS

By MARGARET E. COBB, MARGARET KINCAID, and M. F. WASHBURN

In a study ("Accuracy of Visual Memory and Speed of Verbal Perception in Poor Spellers," this JOURNAL, vol. 28, page 157), published in 1917, it was shown that a group of 'constitutionally' poor spellers were inferior to an equal group of good spellers (1) in the accuracy of immediate recall of visual non-verbal material, and (2) in the speed with which words were recognized, as measured by performance in the Reading Backwards Test. The two groups were about equal in their performance of a test of visual-verbal memory, where the material, of course, could readily be translated into auditory terms. Hence the existence of slight defects (1) in pure visual immediate memory and (2) in the ability to recognize words was suggested. The present study aimed to investigate further the possible existence of a defect in dealing with verbal material: an inability to perceive words readily and accurately.

Each member of a group of fifty-eight bad spellers, reported by the English Department, and each member of a group of sixty good spellers, was given two tests. The first was the familiar word-building test, where the observer is asked to form as many words as possible out of the letters a, e, o, b, m, t.

For the second test, a passage of one hundred words of prose was selected. The observers were asked to copy the passage as rapidly and accurately as possible. The time required was taken with a stop-watch. They were then asked to make with pen or pencil 100 loops half an inch high, as rapidly as possible, and the time required for this was measured in the same way. In the case of each individual, the time for copying the passage was divided by the time required to make the loops, and the quotient was regarded as measuring indirectly the time required by that individual to perceive and react with appropriate writing movements to the words of the passage. That is, it was argued that the purely mechanical execution of writing movements was represented by the loop making; that writing words would require a certain average multiple of the loop-making time, and that quotients of loop-making time into copying time below or above this average would point to variations in the processes peculiar to the copying of words rather than the making of loops.

The results of test (1) were as follows. The good spellers made on the average 22.9 words from the letters, with a mean variation of 3.6 words. The bad spellers made an average of 19 words, with a mean variation of 3.4 words. The distribution of the scores showed a real superiority in word-building on the part of the good spellers. Scores between 10 and 15 words were made by 9 bad spellers and 1 good speller. Scores between 15 and 20 were made by 23 bad spellers and 16 good spellers. Scores between 20 and 25 were made by 19 bad spellers and 28 good spellers. Scores between 25 and 30 were made by 8 bad spellers and by 10 good spellers. Scores between 30 and 35 were made by no bad spellers, and by 4 good spellers. These figures indicate also that very poor performance in word-building is more

nearly peculiar to bad spellers than very good performance is of good spellers.

The results of test (2) showed an average quotient of copying time divided by loop time of 5.4 seconds, m.v. 1.2, for the good spellers, and 5.99 seconds, m.v. 1.2, for the poor spellers. The individual results, however, are distributed in a way which shows no real superiority for the good spellers. This distribution was as follows. Quotients 2.25 to 2.5, one good, one bad speller. Q. 2.75 to 3, one bad speller. Q. 3-3.25, four good spellers. Q. 3.25-3.5, one bad speller, four good spellers. Q. 3.5-3.75, one bad speller. Q. 3.75-4, one bad speller, six good spellers. Q. 4-4.25, one bad speller, two good spellers. Q. 4.25-4.5, one bad speller, two good spellers. Q. 4.5-4.75, three bad spellers, one good speller. Q. 4.75-5, four bad spellers, one good speller. Q. 5-5.25, five bad spellers, four good spellers. Q. 5.25-5.5, three bad spellers, seven good spellers. Q. 5.5-5.75, five bad spellers, two good spellers. Q. 5.75-6, two bad spellers, six good spellers. Q. 6-6.25, five bad spellers, one good speller. Q. 6.25-6.5, seven bad spellers, four good spellers. Q. 6.5-6.75, four bad spellers, three good spellers. Q. 6.75-7, two bad spellers, six good spellers. Q. 7-7.25, two bad spellers, no good spellers. Q. 7.25-7.5, three bad spellers, three good spellers. Q. 7.5-7.75, one bad speller, no good spellers. Q. 7.75-8, no bad spellers, one good speller. Q. 8-8.25, three bad spellers, one good speller. Q. 9-9.25, no bad spellers, one good speller. Q. 9.75-10, one bad speller, no good spellers. Q. 16.8, one bad speller.

The larger the quotient, the poorer, according to our argument, the verbal perception. The scattering of these results, however, shows that the test failed to bring out any characteristic difference between the good and bad spellers in this respect. It is quite possible that the time required for making loops is not a fair representative of the speed of the mechanical processes in writing. A person who can make loops fast, that is, may not necessarily be a person who can execute rapidly the more complicated movements of writing words. Thus our quotients may have contained differences due to purely mechanical writing processes.

The study shows that good spellers have greater verbal ability than bad spellers, as measured by the number of words they can construct out of a given set of letters.

XXXVI. EXPERIMENTS ON A POSSIBLE TEST OF AESTHETIC JUDGMENT
OF PICTURES

By JUDITH CATTELL, JOSEPHINE GLASCOCK and M. F. WASHBURN

The following study represents a preliminary exploration of one part of the field mentioned in the title. The materials used were thirty-six Cosmos prints in black and white of the following pictures:

1. Holbein: The Ambassadors.
2. Thorn: Song Without Words.
3. Ruysdael: Forest of Oaks.
4. Delobbe: Noonday Rest.
5. Holbein: Madonna of the Meyer Family.
6. Berne-Bellecour: The Intended.
7. Haquette: Departure of the Fishing Boat.
8. Hofmann: Jesus and the Woman of Samaria.
9. Alma Tadema: Sappho.
10. Naujok: St. Cecilia.
11. Millet: The Gleaners.
12. Plockhorst: Christ Blessing Little Children.
13. Mauve: Sheep, Spring.
14. Knaus: Holy Family.
15. Dicksee: Young Handel.
16. Gardner: David the Shepherd.
17. Holman Hunt: The Shadow of the Cross.
18. da Vinci: The Virgin of the Rocks.
19. Raffaelino: Madonna with Angelic Choir.
20. Turner: The Fighting Temeraire.
21. Piglhein: Star of Bethlehem.
22. Murillo: Children of the Shell.
23. Piloty: Thusnelda.
24. Frise: Reconnaissance by Lions.
25. Del Sarto: Madonna of the Harpies.
26. Del Sarto: Entombment.
27. Murillo: Madonna.
28. Ver Meer: Young Lady with Pearl Necklace.
29. Holmes: Kiss Me.
30. Boughton: Two Farewells.
31. Douglas: Jersey.
32. de Hooch: Dutch Interior.
33. Haquette: The Return to the Port.
34. Aubert: Cupid's Convention.
35. Thumann: The Fates.
36. Gardner: An Improvised Cup.

These pictures were chosen to represent as wide a range as possible, from the sentimentally popular to the technically great. The titles and the names of the artists were removed from the pictures before they were used. They were then put into the hands of the three experts in the Vassar department of art, Messrs. O. S. Tonks, A. E.

Bye, and Clarence K. Chatterton. These gentlemen, for whose co-operation we wish to express our thanks, were asked to arrange the pictures in the order in which they would choose to own the originals (the financial value of course being left out of account). From the ranks which these three authorities assigned a picture the average rank of that picture according to expert judgment was computed; and thus a combined ranking, the standard ranking, was obtained for the whole series of thirty-six. The order, beginning with the highest, of the pictures in this standard ranking was as follows: 11 and 28 (equal), 13, 20, 32, 18, 5, 1, 26, 25, 17, 22, 19 and 9 (equal), 3, 27 (here a considerable drop in the average rankings occurred, indicating that the pictures below this point were considered by the experts as markedly inferior to those above it), 23, 6, 14, 24, 12, 15, 10 and 7 (equal), 8, 16, 21, 35, 33, 34, 36, 30, 4, 31, 2, 29. The average deviations of the three experts in their judgments of the rank of a particular picture ranged from 7.8 places down to .4 of a place, and the average of these averages for all the pictures was 3.4 places.

One hundred and forty-four women student observers were now required successively to perform the same experiment; that is, to rank the thirty-six pictures in the order in which they would be, for their own sake, desirable possessions to the observer making the ranking. When each observer had completed her arrangement, she was asked the following four questions: "Have you ever studied drawing or painting? Have you ever studied the history of art? Have you visited many picture galleries? Are you especially interested in pictures?"

The rankings which these one hundred and forty-four observers gave the pictures were treated in two ways. First, a rank-difference correlation was obtained between each observer's rating of the pictures and the expert rating. These correlations varied from $+.82$ to $-.42$; their average was $+.19$, with a mean variation of $.26$. Then, secondly, a combined ranking of the pictures for all the one hundred and forty-four observers was obtained, by averaging the ranks assigned by all the observers to one picture, repeating this process for each of the other pictures in turn, and ranking the pictures on the basis of these averages. A rank-difference correlation was then found between this ranking (which we shall call the 144 O. ranking) and the expert ranking. The correlation was found to be $+.33$, with a probable error of $.10$.

Three small groups were then selected from the total number of observers, seventeen in each group. The first group was composed of observers who answered "yes" to all the questions, and therefore represent those most artistic in training and taste. A combined ranking from Group I showed a rank-difference correlation with the expert ranking of $+.49$, probable error $.09$. Group II contained the observers who answered "no" to all the questions, and thus might be considered the least artistic. The ranking formed from their combined judgments gave a correlation with the expert ranking of $-.11$. Group III contained observers who answered "yes" only to the last question; that is, they were without artistic training of any sort, but were interested in pictures. The correlation of the ranking formed from their combined judgments and the expert ranking was $+.43$, nearly as high as that of Group I.

Some interesting points of difference appeared between these three groups as regards the average rank which they assigned to particular pictures. We have seen that the experts placed picture 11 (Millet's *Gleaners*) and picture 28 (ver Meer's *Young Lady with Pearl Neck-*

lace) together at the head of the list; picture 13 (Mauve's Sheep) stood next; picture 29 (Holmes: Kiss Me) was at the foot, and picture 31 (Douglas: Jersey) ranked next but one to the last. Now in the combined ranking of all 144 observers, picture 13 stood at the head and picture 31 at the bottom. Group I (the artistic), also put 13 at the top and 31 at the bottom. Group II (the wholly inartistic), put 13 at the top; but at the bottom they put number 1, Holbein's Ambassadors, which the experts rated as eighth from the top. Group III, the observers who were untrained but interested in pictures, approached more nearly to the experts in putting picture 11 at the top; 31 being at the bottom.

It thus appears (1) that technical training makes the rankings assigned to these thirty-six pictures correlate more closely with the rankings assigned them by experts, which might have been expected; and (2) that a declared interest in pictures, quite apart from any kind of training, has a noticeable effect in producing closer approximation of the judgments to those of experts.

As the results were further studied, it became apparent that the rating given by an individual to one or two pictures out of the thirty-six was of marked significance as showing that individual's agreement with the expert standard. This was noticeably true of picture 28, Ver Meer's Young Lady with Pearl Necklace, which the experts put at the top of the list. This picture has but little literary appeal; its excellence is in a high degree technical. Its rank in the combined 144 O. ranking was 20; the totally inartistic group II placed it as low as 30; the highly artistic group I put it at 12, and the untrained but interested observers of group III again showed the effect of their natural taste by rating it at 16.

Other indications of the diagnostic significance of an observer's reaction to picture 28 were obtained from a study of the indexes of correlation between a given individual's ranking of the pictures and the expert ranking. There were fifty-nine persons who gave either negative correlations or positive correlations less than $+10$. The rankings which these persons gave to picture number 28 were well massed beyond twenty: there were eleven who put it at the bottom of the scale and only six who ranked it better than twentieth: the average ranking was 28.3. There were forty-one observers who had positive correlations of over 40; the ranks which these assigned to picture 28 were massed at the upper end, there were only five who ranked it beyond eighteen, and the average ranking was 8.8. Thus a difference of 19.5 places appeared between the average ranking of 28 by the observers whose ranking of the whole series of 36 pictures failed to correlate or correlated negatively with the expert ranking, and the average ranking of 28 by the observers whose ranking of the whole series correlated with the expert ranking by more than $+40$. These results may be compared with those for picture 11, Mauve's Sheep, a picture which is attractive in subject as well as in technique. The massing of the rankings of this picture was at the upper end in the case of both the low correlation groups and the high correlation groups; the average ranking for the low correlation group was 6.8, that for the high correlation group 5.3, a difference of only 1.5. In other words, everybody liked this picture.

Further, we looked up the indexes of correlation for the individuals who had assigned rankings from 26 to 36, or the last ten ranks, to picture 28, and found that out of 53 individuals only five, or 9.4%, had correlations of over $+40$. Of the 32 individuals who assigned to picture 28 a rank somewhere among the first ten places, there were

only 12, or 32.4%, who had correlations below $+.40$. It would seem that assigning a low rank to picture 28 is a better indication of poor artistic judgment than assigning a high rank to this picture is of good artistic judgment.

Finally, another expression for the diagnostic significance of the rank which an observer assigned to picture 28 was sought in the following way. An average was taken of the indexes of correlation obtained between the ranking of the whole series of thirty-six pictures and the expert ranking, for all the observers who assigned rank number 1 to picture 28. A similar average of the coefficients was made for all the observers who assigned rank number 2 to picture 28, and so on for each of the thirty-six ranks that could be assigned to this picture. Of course the number of observers assigning the same rank to picture 28 was not equal for all the ranks; it varied from twelve (for the lowest rank, 36) to one (for ranks 16, 19, and 30), so these averages were not very significant. But if the judgment made on picture 28 were a perfect index of the degree of correlation between an observer's ranking of the thirty-six pictures and the expert ranking, so that one could predict the correlation from the judgment on this one picture, evidently the averages of the indexes for observers who made the same ranking of picture 28 ought, when arranged in numerical order, to follow the order of the ranks assigned to 28. Thus, the average of the correlation indexes of the observers who ranked picture 28 as number 1 ought to be the highest average; that of the observers who ranked picture 28 as number 2 ought to be the next highest, and so on down. A rank difference index of correlation was accordingly found between the thirty-six average indexes and the order 1 to 36, and this coefficient was found, in spite of the inadequacy of the averages, to be $+.78$. Thus it would appear that if this series of pictures is used, ranking picture number 28, *ver Meer's Young Lady with Pearl Necklace*, anywhere in the last ten places means in nine cases out of ten low correlation with the expert judgment on all the pictures; ranking it among the first ten places means in two cases out of three high correlation with the expert judgment on all the pictures.

MINOR STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF CORNELL UNIVERSITY.

Communicated by E. B. TITCHENER and H. P. WELD

XLII. THE PSYCHOLOGICAL ATTITUDE OF CHARLES DICKENS TOWARD SURNAMES

By E. DE LASKI

This paper is one of a series begun by Kollarits¹ and Claparède,² and continued by English³ and Alspach,⁴ on the psychological response to proper names. Kollarits and English have made out the associative factors which condition the response, the latter finding in particular that, except perhaps in the case of highly responsive observers, the mere sound of the name is not an important factor. Since this result was contrary to a suggestion of Claparède's, English proposed two problems for further investigation: (1) a detailed analysis of the reactions of highly responsive observers, and (2) a psychological examination of the proper names employed by certain writers of fiction. Alspach undertook the first of these studies in the case of a single observer; and we now report a study of the second problem as regards a single author.

We selected Charles Dickens, partly because Claparède had said that this author among others invented names which by their physiognomy suggested particular types of persons, and partly because there seems to be a general belief that Dickens was highly successful in choosing names which suited his characters. This is, indeed, the general conclusion reached by Gordon, who has written a monograph on the subject.⁵ There are, however, two points of view here involved which should be clearly distinguished. It is one thing to ask whether a proper name in and of itself may suggest a particular type of individual (Claparède's question), and it is quite another thing to ask whether a given name suits a character whose attributes are known (Gordon's inquiry). In the former case, the name alone is given and the associations are free; in the latter, both name and character are given for comparison, and the associations are therefore controlled. As method, the second procedure is full of pitfalls; not only do old associations stand in the way but, given the laws of Similarity and

¹ J. Kollarits, Observations de psychologie quotidienne, *Arch. de psychol.*, xiv, 1914, 225-240.

² E. Claparède, *ib.*, 301 f.

³ G. English, On the Psychological Response to Proper Names, *This Journal*, xxvii, 1916, 417-434.

⁴ E. Alspach, *ib.*, xxviii, 1917, 436-543.

⁵ E. H. Gordon, The Naming of Characters in the Works of Charles Dickens, *Univ. of Nebraska Studies in Language, Literature and Criticism* (Lincoln, 1917). We do not wish to imply that this paper is open to the following general criticism of method. The author has been cautious, and her paper is highly suggestive.

Contrast, one can argue to the suitability of any name to any character.

The study of an author's psychological attitude to proper names is, of course, a much broader problem. We must inquire first of all into the source or origin of his names; and if we find that he constructed them, then we must discover, if possible, his method. Next, we must examine them as significant, and find out if we can what associative factors conditioned their employment. Then we may attempt a characterization of his attitude. We have found it impossible to carry this programme through all of Dicken's works; and we have, therefore, restricted our examination to *The Pickwick Papers* and *Nicholas Nickleby* as representing the novels of his earlier, and *Our Mutual Friend* as representing those of his later period.⁶

ORIGIN OF DICKENS' SURNAMES

Our positive information concerning Dickens' method of finding names for his characters is slight. We know only that in his 'memo-randa' was a list of christian names selected from Privy Council Education Lists; that there was also a list of 'available names' from which he made selections for the novels between *Little Dorrit* and *Our Mutual Friend* inclusive;⁷ that in some instances he borrowed the names of known persons and places;⁸ that in other instances a name passed through a transition of several changes in spelling before the final form was hit upon;⁹ and, finally, that occasionally he used nicknames which he had invented for intimate friends and his children.¹⁰

These facts make it probable that Dickens borrowed more English surnames than is generally supposed. Accepting this supposition as a hint of method, we set out first of all to determine how many of Dickens' surnames are in fact British surnames. In the course of this search, we discovered a large number of the former which differ from the latter only in suffix: the stems are the same, but by addition, subtraction, substitution, or slight change in spelling, the terminal formatives have been altered. We accordingly listed these as names 'derived from British surnames.' We have, however, also included under this category the few instances of agglutination, and the still rarer cases where the stem itself undergoes a slight change in spelling. Working thus by a method of elimination, we next subtracted those names also which are English words, and those which are 'derived from English words.' We were then left with a 'remainder,' some of which are drawn from various traceable sources, while others are of questionable origin.¹¹ The list by novels under the above categories, and a quantitative summary in the form of a table, follow.

⁶*Pickwick Papers* was written in 1836-37; *Nicholas Nickleby* in 1838-39; and *Our Mutual Friend* in 1865. We shall hereafter refer to these works in the order named as P. P., N. N., and O. M. F.

⁷J. F. Forster, *Life of Charles Dickens*, iii, 1874, 262 ff.

⁸Forster, *op. cit.*, i, 1874, 32, 88 note; J. Kitton, *Charles Dickens, His Life, Writings and Personality*, 24; P. FitzGerald, *History of Pickwick*, 86, 153 f, 310.

⁹Forster, *op. cit.*, ii, 1873, 23; Kitton, *op. cit.*, 174 ff.

¹⁰G. Hogarth and M. Dickens, edd., *Letters of Charles Dickens*, 1893, 101.

¹¹The dictionaries to which we have had access are: W. Arthur, *An Etymological Dictionary of Family and Christian Names* (1857); H. Barber, *British Family Names* (1894); C. W. Bardsley, *A Dictionary of English and Welsh Surnames* (1901); H. Harrison, *Surnames of*

PICKWICK PAPERS

British Surnames: Allen, Bamber, Bardell, Brooks, Budkin, Bullman, Bulder, Burton, Clarke, Craddock, Crawley, Cummins, Dodson, Dowler, Edmunds, Fogg, Goodwin, Griggs, Grub, Grundy, Gunter, Gwynn, Harris, Heyling, Hopkins, Humm, Hunt, Hunter, Jackson, Jinks, Lowten, Lucas, Magnus, Mallard, Manning, Martin, Miller, Mudge, Payne, Pell, Pickwick, Pipkin, Pott, Price, Raddle, Rogers, Roker, Sanders, Sawyer, Simpson, Smart, Smithers, Smithie, Snodgrass, Staple, Stiggins, Tompkins, Tomlinson, Trotter, Trundle, Tupman, Walker, Wardle, Weeks, Weller, Wicks, Wilkins, Winkle.

*Derived from British Surnames:*¹² Ayresleigh (Ayres and Leigh), Bantam (Banton), Beller (Bell, Bellard), Bilson (Biller, Billing), Boffer (Boffey), Budger (Budge, Budgen), Blazo (Blaze, Blazy), Clubber (Clubb), Crooke (Crook, Crooke, Crooks), Dubbley (Dubber, Duberly), Dumkins (Dumville), Fitzmarsh (Fitz and Marshall), Fizkin (Fitz, Fidkin, Fitkin), Hutley (Hutt, Hutson), Lobbs (Lobb), Luffey (Luff), Matinter (Mattin), Mordlin (Mordan, Morden), Mudberry (Mudie, Muddieman), Muzzle (Muzzell), Noddy (Nodder), Perker (Perk, Perkins), Phunky (Funk), Podder (Podd), Ramsey, (Ram, Ramsden), Simmery (Simm, Simmons), Tadger (Tady), Tappleton (Tapp, Tapper), Tuckle (Tuck, Tuckey), Watty (Watt), Whiffins and Whiffers (Whiff), Witherfield (With, Witherow).

English words: Jingle, Namby, Slum, Snicks, Snipe, Smouch, Struggles.

Derived from English words: Blotton, (blot, blotten), Bolo (bolus), Boldwig, Buzfuz, Crushton (crush), Filletoville, Fizzgig, Flasher (flash), Grummer (grum), Mutanhed, Nockemorf, Skimpin(g), Slammer (slam), Slasher (slash), Slumkey (slum), Smiggers (smigg), Smorltork, Snubbin(g), Snuphanuph, Stareleigh (stare), Prosee (prose), Porkenham.

Remainder: Bladud, Cluppins, Donna, Christina, Groffin, Gurgum, Lud, Mivens, Nupkins, Pruffle, Quanko Samba, Slurk, Smangle, Smauker, Slummintowken, Tollinglower, Upwitch, Wugsby. Bladud, son of Lud, is a mythical king, reputed founder of the city of Bath. Christina was queen regent of Spain during the years 1833-40. Slurk and Smangle suggest lurk and mangle. Cluppins, Groffin, Gurgum, Mivens and Nupkins have as stems archaic or provincial words which may have been known to Dickens; cluppe (to embrace) or clop (to hobble), groffe (ground), gurgy (a stubby hedge, Scotch gurg, to make

the United Kingdom (1912-19-); M. A. Lower, A Dictionary of the Family Names of the United Kingdom (1860); L. Wagner, More About Names (1893); id., Names and their Meaning (1892); E. Weekly, The Romance of Names (1914); id., Surnames (1916). The Scottish equivalents will be found in A. Warrack, *A Scots Dialect Dictionary* (1911); the obsolete and provincial terms in T. Wright, *Dictionary of Obsolete and Provincial English* (1857), and J. Wright, *The English Dialect Dictionary, 1898-1905*. We have also consulted the slang dictionaries, particularly that of J. S. Farmer and W. E. Henley, but to no avail; Dickens, apparently, did not employ slang in forming surnames.

¹²The names within parentheses are the nearest discoverable British surnames.

a creaking noise), miver, miveys (a mortar, marbles), nup, nupson (fool). Upwitch (Upwich) is a village in Kent.¹³

NICHOLAS NICKLEBY

British Surnames: Adams, Belling, Bevan, Bonney, Bray, Brooker, Brooke, Clark, (La) Creevy, Crowl, Cutler, Digby, Dowdle, Green, Hawk, Hawkins, Jenkins, Jennings, Johnson, Lane, Matthews, Mobbs, Palmer, Pitcher, Pluck, Price, Pyke, Simmonds, Squeers, Thomas, Tompkins, Watkins, Westwood.

Names derived from British Names: Blockson (Block, Blocker), Bobster (Boby), Bolder (Bold), Browdie (Brow, Brodie), Brown-dock (Brown, Docking), Borum (Borer), Cabbery (Cabble), Chopkins (Chopping), Cobbey (Cobb, Cobby), Cropley (Cropper), Crummies (Crum, Crummock), Curdle (Curd), Dorker (Dorner, Dorling), Folair (Foley, Folgate), Graymarsh (Gray, Marsh), Gregsbury (Greg, Gregson), Gride (Gridely), Grimble (Grimbleby), Knag (Knagg), Kenwigs (Ken, Kendal), Ledrook (Leder, Ledson), Lenville (Leney, Lenain), Linkinwater (Link, Linklater), Lillyvick (Lilly, Vick), Lukin (Luken), Lumbey (Lumby), Marker (Mark), Mogley (Mogford), Muntle (Munt, Mundie), Nickleby (Nickel), Petowker (Peto), Pupker (Puplett), Ruddie (Rudlock), Scaley (Scales), Smifser (Smith, sir), Snewkes (Snooks), Sprouter (Sprout), Timberry (Timbury), Tipslark (Tipler, Lark), Trimmers (Trimmer).

English words: Dabber, Nog(g)s, Snob(b).

Derived from English words: Cheeryble (cheery), Chowser (chouse), Gallanbile, Gazingi, Koeldwethout, Peltirogus (pelt-arogue), Pugstyles, Sliderskew (slide, askew), Snuffim, Tix (tics or ticks), Verisopht, Witterly (wit, titter), Wrymug.

Remainder: Belvawney (bellevue?), Bravassa (bravo), Bulph, Dibabs, Glavermelly, Grudden, Pluggers, Smike, Snawley (snarly), Snevellici (snivel?), Swillenhause. Some of these are apparently derived from Scotch words: Bulph (bulf, a fat person), Glavermelly (glaver, to chatter, babble), Smike (smicker, to smirk, to smile fawningly); Swillenhause (swill, to souse; hause, throat).

OUR MUTUAL FRIEND

British Names: Baldwin, Blight, Blogg, Boffin, Brewer, Cleaver, Day, Dancer, Elwes, Goody, Handford, Harmon, Harrison, Holmes, Hopkins, Jardine, Jones, Kibble, Lightwood, Little, Martin, Mullins, Noakes, Owen, Parker, Reid, Sampson, Taylor, Tippins, Tootle, Twemlow, Venus, Wegg, Wilcocks, Williams, Wood, Wren.

Derived from British Names: Akershem (Ackerson), Bocker (Bock), Boots (Boot), Chicksey (Chick), Gliddery (Glide), Hawkinson (Hawkins), Headstone (Head, Stone), Hexam (Hexter), Higden (Higdon), Jarrel (Jarred), Joey (Joel), Lammle (Lammie), Milvey (Milvain), Overs (Over), Peecher (Pecher), Podsnap (Podd, Podmore), Poddles (same), Potterson (Potter, Potterton), Pubsey (Pudsey), Riderhood (Rider, Hood), Rokesmith (Rokester), Radfoot (Radcliffe, Radway), Sprodgkin (Sprodgeon), Stobbles (Stobbs), Tapkins (Taphouse), Toddles (Todd), Twopence (Twopenny, Fourpence), Whitrose (Whitmore), Wilfer (Wilford, Wilful), Wrayburn (Wray, Burns).

¹³For this origin of Upwitch as a Dickens surname, see FitzGerald, *op. cit.*, 86.

English Words: Buffer, Gruff and Glum, Sloppy, Veneering, Glamour, Linseed, Styles.

Derived from English Words: Fledgeby (fledge, fledgely), Snigsworth (snig), Swoshle (swash, swasher, a swaggerer).

Remainder: Riah (Uriah), Grompus (grumpy; Scotch grumph, growl), Sautouse (dancer).

RELATIVE FREQUENCIES OF THE NAMES UNDER THE VARIOUS CATEGORIES
IN PERCENTS

Novel	British Surnames	Derived from Brit. Names	Eng. words	Derived from Eng. words	Remainder
P. P.	47	22	5	14	11
N. N.	33	40	3	13	11
O. M. F.	46	37	9	4	4

An inspection of the above lists and of the quantitative summary shows unmistakably that a large majority of Dickens' names are either British surnames or easily derivable from them. This does not mean, however, that they were necessarily and knowingly selected as we have classified them. For, in the first place, our categories are not exclusive; a number of good British family names are also good English words; and, as we shall later see, some names which appear in our lists of family names were chosen, primarily at least, for their significance as words. Furthermore, it is logically possible to find still other means of classification, which might prove to be as inclusive as our own. Nevertheless, the fact that of the total of 326 names in the three novels, 74% are British or derived from British family names, and the further fact that less than 10% fail to be subsumed under our four categories, raises a strong presumption that Dickens was not as original in his selection of surnames as is ordinarily supposed.

Dickens, then, did not, apparently, 'invent' names in the strict meaning of that term; he selected names and re-formed them, and he chose meaningful words and constructed names out of them. His favorite device for making new names was, as we have seen, to alter the suffix. In P. P., the new suffixes are principally *er*, *ers* (13 cases), *y*, *ly*, *leigh*, *ee* (10 cases), *in(s)*, *kin(s)* (6 cases), and *an*, *am*, *on* (4 cases). There is only one instance of a word-suffix (*field*). In N. N., the relative frequency of *in*, *kin* decreases, that of *ly*, *le* increases, while that of the other syllables remains about the same. There is, however, a decided increase in the number of word-suffixes (*dock*, *air*, *bile*, *wigs*, *rook*, *ville*, *lark*). Finally, in O. M. F., the decrease is in the frequency of *er*, *ers*, the others remaining at about the same relative frequency; and there is a new list of word-suffixes (*mop*, *hood*, *smith*, *foot*, *rose*, *burn*, *worth*). A second method was to change a given name or word in some way that obscured the original form. Thus the name of the family dog Timberly became Timber; the original nickname of Dickens' son Charley, Master Toby,

was altered into Flaster Floby; and Dickens himself says that Mantalini came in the same way from Muntle. It is, of course, impossible to say how many names in the three novels originated by this method: Riah we are sure of, and we suspect Petowker, Slummintowken, Tollimglower, and Quanko (Sancho).¹⁴ A third contrivance was the ancient trick of making a name out of a pair of words or a phrase spelled more or less phonetically, as *e.g.*, Filletoville, Gazingi, Mutanhed, Peltirotus, Porkenham, Smorltork, Snuphanuph, and Verisopht.

DICKENS' ATTITUDE TOWARD SURNAMES

In the studies of Kollarits, English and Alspach, the principal associative factors which condition the response to proper names have been found to be five in number: (1) suggestion of nationality; (2) meaning of the word; (3) auditory-verbal associations (Gronch suggests gronch, grunts); (4) suggestion by the mere sound of the name (Claparède's 'physiognomy'); (5) suggestion by the same or similar name (Boppum suggests Bottom). Not all these factors are, however, equally effective for all observers; and we may therefore gain an insight into a particular individual's disposition toward proper names by determining what factors are, for him, the more effectual. We propose to analyse Dickens' attitude in this way. It is true that his procedure was in the reverse order of that of the experiments: *i.e.*, he found a name to suit the character, instead of a character to fit the name. Nevertheless our method is justified. For the experiments have again shown that character and fitting name belong to the same attitude; that the name 'points to' the character, just as the character 'points to' the name. We shall, however, make our results doubly sure by reference, where possible, to other sources than the names themselves.

(1) *Nationality.* There is no doubt that Dickens was disposed for the nationality of names. The context tells us that Quanko Samba was West Indian, that Bolero Fizzgig and Christina were Spanish, that Koëldwethout and Swillenhausen were German, that Sauteuse was French, and that Smorltork was a foreigner. Furthermore, Dickens explains that Mantalini was "originally Muntle, but it had been converted by easy transition into Mantalini: the lady rightly considering that an English appellation would be of serious injury to the business."¹⁵ Perhaps Snevellici (snivel), Belvawney (belle-vue?), Bravassa (bravo), and Glavermelly (glaver), all of which are part English and part foreign, were chosen for a similar reason.¹⁶ Finally, since Dickens was writing English stories, it must have been his "feel" for the nationality of a name that led to his reliance on English surnames in good standing and on names derived from them. The trick of retaining the stem and adding a new (but an English) suffix gives to a name, in itself unfamiliar, all the familiarity of an

¹⁴Gordon suggests that Dickens may also have employed what Weekley terms 'baby phonetics' in the formation of surnames. Thus, Mudge may be a childish pronunciation of Smudge, and Smangle of Mangle. In the former the initial s is dropped, in the latter an inorganic s is added. Gordon, *op. cit.*, 28; E. Weekley, *Romance of Names*, 39 f.

¹⁵N. N., x.

¹⁶Alspach's observer reported that a combination of factors may occur in a single name, and that occasionally they may point in opposite directions: *op. cit.*, 438 f.

English name. Despite the general certainty of Dickens' touch for nationality of the name, there are, however, occasional lapses: Fizzgig, for example, is not Spanish, and neither Bolo nor Blazo is characteristically English.

(2) *Meaning of the Word.* The large number of names that are also English words is, in itself, indicative of Dickens' use of the meaning of the word as an associative condition. But there is further evidence in the novels. For example, we read of the "dismal boy whose appropriate name was Blight;"¹⁷ we are told that Buffer, Boots and Brewer are in fact "stuffed Buffers interposed between the rest of the company and possible accidents."¹⁸ Finally, not to multiply instances, Dickens clearly reveals his attitude in this regard by his account of the neighbors' attempt to supply christian names for Wilfer, who signed his name with an R. "Some of these were more or less appropriate: as Rusty, Retiring, Ruddy, Round, Ripe, Ridiculous, Ruminative; others derived their point from their want of application; as Raging, Rattling, Roaring, Raffish."¹⁹ Here we have the traditional laws of Similarity and Contrast. The latter, however, Dickens himself seems to have employed only rarely. The name of Venus is probably one such instance; Lammle, another; and the christian name of Pleasant Riderhood is an anomaly which causes Wegg to exclaim: "Pleasant! Dear me! Seems to express what she might have been if she hadn't made that unpleasant remark—and what she ain't in consequence of having made it."²⁰

All told, 82 of the 327 names in our three novels are English words. Thirteen of these, however, are either too common as surnames to be suggestive, or of so little descriptive value as to be insignificant (e.g., Brooks, Hunt, Hunter, Miller, Walker, Wood).²¹ On the other hand, there are 63 names which are so like English words as to have all their descriptive value; e. g., Poddles, Toddles, Chopkins, Podsnap, Flasher, Borum, Pupker. There are then 118 names, 36%, that are obviously significant.²²

(3) *Auditory-Verbal Associations.* The external evidence for the presence of this factor in Dickens is his fondness for rhyming and alliterative names, and for the obscuring changes which we have already noted. The instance in which the judge in Pickwick's trial mistakes Phunky for Monkey is, of course, a case in point. A name which properly belongs to this group is one that readily suggests one or several words which are similar in sound and meaning, and that accords with an attitude common both to the words and to the name. Examples taken at random are: Tadger, badger; Bobster, lobs-

¹⁷O. M. F., viii.

¹⁸O. M. F. i, ii.

¹⁹O. M. F. i, iv.

²⁰O. M. F. iii, vii.

²¹In P. P., Dickens forces the meaning of *Hunter* by the prefix *Leo*.

²²Our criterion for the classification of these names was to accept a name to which a number of American college students responded with the stem, or suffix, or both (as in Podsnap), when instructed to react with the 'first word that came.' The method is arbitrary, but the results check numerically with a classification by derivation (i.e., names derived from English words). We have omitted, however, those names which seemed to be derived from archaic, provincial or Scotch words. If these be admitted as significant for Dickens, then the percentage of names significant for him would be about 40%.

ter; Grompus, grumpy; Grimble, grumble. A prettier instance, one noted by Gordon, is Squeers, which suggests queer, sneer, shear, squeeze, squirm, squeal, etc.²³ There is a 'feel' about these words which, when taken as descriptive, belongs to the 'feel' we have for the character. We have found, again checking our own selections by experiments with a group of college students, 53 of these words, or about 15% of the total.

(4) *Suggestion by Mere Sound of the Name.* Dickens gives direct proof of his 'feel' for the sound of a name in the following protocol: "Reginald Wilfer is a name with rather a grand sound, suggesting on first acquaintance brasses in country churches, scrolls in stained-glass windows, and generally the De Wilfers who came over with the Conqueror." And he gives indirect evidence in the names themselves. We learn from the experimental investigations that, "other things being equal, a long name is a bit important, a short one a little contemptuous;" and 70% of the names in our three novels are of two syllables, 15% of one syllable, and nearly all those of three and four syllables are absurd concoctions like Mutanhed, Slummintowken, etc. Again we are told that the shorter and thinner vowels suggest quick and slight movements and slender objects, i.e., active, small, or more or less insignificant persons; and about 65% of our names have short vowels in the accented syllable; *i* as in *it*, *u* as in *up*, and *a* as in *at* predominate in the order named.²⁴ Furthermore, short or thin vowels in combination with initial and final stopped-consonants (cat, pet, tip, but, etc.) are so suddenly initiated and quickly stopped as to make these the most insignificant of words; when, however, a suffix is added to such a word, particularly when the final consonant of the stem is doubled or two stopped-consonants are used in combination (Podder, Tadger), an odd, droll, rustic effect is produced, which rests upon the sound of the light vowel in combination with the heavy, ponderous consonants. 66% of the dissyllabic names in our lists have one or more stopped-consonants (b, d, g, p, t, k) in the middle of the name; only 17% have the liquids l, m, n, r; and 7% f, ff, or th. Finally, the variation in the sound of the suffixes, which we have noted above, is significant. Syllables are less sonorous than word-suffixes, and the former prevail in P. P., the latter in N. N. and O. M. F. Furthermore, the word-suffixes in O. M. F. have a greater dignity of sound than those in P. P.

On the whole, it seems clear that Dickens' attitude toward the sound of surnames led him to choose names of a general type; they tend to be short in length, and to consist of short or thin vowels in combination with stopped consonants in the middle of the name. Their suffixes are also thin in sound, but tend to become more sonorous in the later novels. The result is a type of name suitable to the lower and middle classes, and to stupid or silly persons of the upper class, to characters a little contemptible, odd, awkward, clumsy, droll. That there are numerous exceptions only goes to show that the type does not fit all the characters; but it is surprising how few broad, generous, dignified sounds there are in the list.

We cannot, of course, say how many names were recommended to Dickens solely by their sound. There can be little doubt of those like Dibabs, Gride, Grudden, Folair, Petowker, Lillywick, Pickwick,

²³Gordon, *op. cit.*, 27. Similar instances are here given from other novels.

²⁴See references cited by Alspach, *op. cit.*, 440.

Nickleby, and Wrayburn,²⁵ which do not readily suggest meanings; but in so many instances sound and meaning unite in their effect that it is impossible to say which factor conditioned the choice. Furthermore, it is probable that some of the names which to us are too common to be of any significance whatever were, for Dickens entirely relevant. Our estimate, therefore, of the names that are suitable only by sound (as about 10%) has little value.

(5) Previous experiments have also shown that, if the stimulus-name happens to be identical with or similar to that of a known person, then the person described will frequently have the attributes of the person known. That Dickens was guided by this principle is evident from the name Stareleigh which, as the biographers tell us, is a verbal modification of Gaslee, a judge of the time whom Dickens openly ridiculed.²⁶ Furthermore, the names Venus, Bladud, Christina, and if our guess is correct Quanko Samba, were apparently also used with the intention of suggesting the originals.

What then, shall we say of the large list of British names, many of which were borrowed from known persons and were therefore familiar to some of his readers, and others of which (like Allen, Green, Jackson, Martin, Williams, Wood) were among the commonest in all England, and were therefore familiar to everybody?²⁷ Was Dickens psychologically justified in assigning them to his characters? In the first place, we have already seen that he was justified on the score of nationality. In the second place, he may have perceived a suitability in the name despite old associations, and have depended upon the story to furnish new associations which should eventually take precedence of the old. Or, finally, it may be that he employed the name as a tag or label, without raising the question of its suitability. This must certainly have been his motive as regards the very common names: for as a rule they are assigned to secondary characters, and no attempt is made to give them reality. According to our count, 40 of the 327 names, or 12%, have no other significance than that of mere label.

We have found, thus far, in our analysis of Dickens' attitude toward surnames, that he was strongly disposed to employ those that were actual British names, or were derived from these or from English words. He did not invent his names outright, but constructed them by change of suffix or spelling or by intentionally facetious corruption. His selection was conditioned upon nationality; upon explicable meaning (including that reached by auditory-verbal associations); upon the bare sound of the word; and upon the associations aroused by the same or by a similar name. As a result, about half of his names are directly or indirectly descriptive of individual traits. His list as a whole tends toward a type of name which expresses an individuality somewhat contemptible, awkward, clumsy, droll. Many names, nevertheless, have no other significance than that of identifying labels.

There is thus no reason to suppose that Dickens is exceptional in his attitude toward surnames. He is 'highly responsive' to these words; and his keen dramatic instinct,²⁸ his tendency toward strong lines of characterization (critics have charged him with caricature), and his

²⁵Although there may be a pun in Ray-burn and Light-wood.

²⁶Kitton, *op. cit.*, 45.

²⁷See E. Weekley, *Romance of Names*, 43 ff.

²⁸We have found no evidence, though we looked for it, that Dickens took names from the characters of plays.

exuberant animal spirits, have led him to admit punning and farcical names which remain in our memory and shed their glow over the rest.²⁹ More distinctive than the attitude toward surnames is the attitude which we have discovered toward the *characters* of the novels studied. On the whole, if we may trust the evidence of the names, Dickens tends to look down on his characters; he stands apart and exhibits them, pointing out their weaknesses and uncouthnesses with a sort of good-humored superiority. This collateral outcome of the present study is confirmed, so far as we have read, by literary criticism.

²⁹A parallel study—now unfortunately interrupted—of the surnames in George Meredith's novels seems to show that in this as in other respects Meredith is the direct successor of Dickens in the history of the English novel.

NOTES ON THE PRESIDENTS OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION

By CLYDE B. MOORE, State Normal School, La Crosse, Wisconsin.

The American Psychological Association since its founding has sought to include within its membership those who are representative of the best work in the fields of psychological research in America. For the most part the membership is made up of members of the departments of psychology in the leading American universities. However it does not necessarily follow that a member of the Association must be connected with a university as witness a recent interpretative note on membership: "A proposal for membership signed by at least two members of the Association must be submitted to the Secretary, for the Council, at least one month in advance of the annual meeting. The proposal must be accompanied (1) by a statement of the candidate's professional position and degrees, naming the institutions by which, and the dates when, conferred, and (2) by copies of his published researches. In the absence of acceptable publications of a psychological character, or a permanent position in psychology, the conditions of membership will not be regarded as having been fulfilled."¹

The above quotation is indicative of the rare care taken by this organization in the selection of its members. It seems but fair to assume that, with such care in the selection of mere members, the selection of officers for the Association refines the membership process many fold with the result that only the eminent scholar in psychology shall become the head or president of the Association. It is on this assumption that the following investigation was made. The problem was to tabulate and summarize the training of the presidents of the American Psychological Association.

The investigation covers the period of twenty-six years (1892-1917). During this period there have been twenty-five different persons to act as president.² (See table.) Of these twenty-five persons twenty were American born and five foreign born. Twenty-four men and one woman have held this office, Mary Whiton Calkins being the only woman to attain this distinction. According to data available all were American citizens at the time of holding office with the exception of Hugo Münsterberg. Nineteen of the twenty-five had received the Ph. D. degree, thirteen receiving the doctorate from American universities and six from European universities. Johns Hopkins and Leipzig tie in the number of doctors attaining the honor each furnishing four, Harvard and Columbia ranking next each furnishing two—Harvard giving the founder and first president in G. Stanley Hall.

Four are natives of the state of Massachusetts, three California, two South Carolina, two Pennsylvania, two Vermont, two New York, and

¹Psy. Bulletin, Feb. 15, 1917, p. 39.

²Proc. Am. Psy. Assn.

³Wm. James served as president in 1894 and again in 1904.

TABLE

Year	Name	Native State	Baccalaureate Degree	Doctor's Degree
1892	G. Stanley Hall (1846-)	Mass.	Williams 1867	Harvard 1878
1893	George Trumbull Ladd (1841-)	Ohio	Western Reserve 1864	
1894	Wm. James (1842-1910)	N. Y.	Lafayette 1880	Leipzig 1886
1895	J. McKeen Cattell (1860-)	Penn.	U. of Penn. 1879	Muhlenberg 1892
1896	George S. Fullerton (1859-)	Tatehgarh, India	Princeton 1884	Princeton 1889
1897	J. Mark Baldwin (1861-)	S. C.		Leipzig 1885
1898	Hugo Münsterberg (1863-1917)	Danzig, Germany	U. of Vermont 1879	Johns Hopkins 1884
1899	John Dewey (1859-)	Vermont	U. of Penn. 1882	Johns Hopkins 1886
1900	Joseph Jastrow (1863-)	Warsaw, Poland	U. of Cal. 1875	Johns Hopkins 1878
1901	Josiah Royce (1855-1917)	Cal.	U. of Cal. 1883	Johns Hopkins 1888
1902	E. C. Sanford (1859-)	Cal.	Ind. Univ. 1884	Clark 1892
1903	Wm. L. Bryan (1860-)	Ind.		
1904	Wm. James (1842-1910)	N. Y.	Smith 1885	
1905	Mary Whiton Calkins (1863-)	Conn.	U. of Mich. 1890	
1906	James R. Angell (1869-)	Vermont	Columbia 1873	Leipzig 1896
1907	Henry Rutgers Marshall (1852-)	N. Y.	U. of Cal. 1888	Leipzig 1896
1908	G. M. Stratton (1865-)	Cal.	Wesleyan 1894	Cornell 1896
1909	C. H. Judd (1873-)	Bareilly British India	U. of Nebr. 1892	Yale 1895
1910	Walter B. Pillsbury (1872-)	Iowa	Gustavus Adolphus 1891	Columbia 1898
1911	C. E. Seashore (1866-)	Mörlunda, Sweden	Wesleyan 1895	
1912	E. L. Thorndike (1874-)	Mass.	Princeton 1889	Columbia 1899
1913	H. C. Warren (1867-)	N. J.	Amherst 1891	Chicago 1903
1914	R. S. Woodworth (1869-)	Mass.		U. of Halle 1896
1915	J. B. Watson (1878-)	S. C.	Williams 1893	Harvard 1901
1916	Raymond Dodge (1871-)	Mass.	Ursinus Coll. 1897	
1917	Robert M. Yerkes (1876-)	Penn.	Harvard 1898	

two were born in India. Ohio, Indiana, Connecticut, Iowa, New Jersey, Sweden, Germany and Poland have each furnished one.

Honorary degrees have been conferred on a number of the presidents and several hold professional degrees in medicine and theology. Many have received international recognition in different ways and not a few hold superior ratings in other fields of science. Several hold responsible executive positions, G. Stanley Hall and Wm. L. Bryan as university presidents. Charles Hubbard Judd sustains the distinction of being the youngest at the time of his election to the presidency and Wm. James the only person to have the honor of twice serving as president. Three of the group have completed their work, Wm. James passing in 1910 and Josiah Royce and Hugo Münsterberg in 1917.

BOOK NOTES

An ethical philosophy of life, presented in its main outlines. By FELIX ADLER. New York, D. Appleton and Co., 1918. 380 p.

This book records a philosophy of life growing out of the experience of a lifetime. The convictions put forth in it are not dogmatic if dogma is the conviction of one man imposed authoritatively on others, but they are simply submitted to those who search for light on the problems of life, and the author hopes that some of his fellow searchers will find these views congenial and that still others will find practical suggestions that are useful. The book is divided into four parts: autobiographical introduction; philosophical theory; its applications to life, sickness, sin, property, reputation; and fourth, the theory as applied to social institutions, family, state, etc. The chief problems are how to establish the fundamental ethical dictum that everyone should count. We need also to know how to attach precise meaning to the term spiritual, also how to link up the world's activities in science, art, business, etc., with the supreme ethical end; and lastly, how to lay foundations whereon to erect a conviction that there really is a super-sensible reality. This work is a summary of a lifetime and in it are found epitomes of most of the author's other writings, so that it is a work of great value.

The field of philosophy; an outline of lectures on introduction to philosophy. By JOSEPH ALEXANDER LEIGHTON. Columbus, R. G. Adams and Co., 1918. 414 p.

This was prepared for class work. The author's point of view is so unique that it is a little difficult to tell whether we have before us a history of philosophy or a treatise on epistemology. If Zellar's conception of the function of a historian of philosophy is correct, that he must so completely efface his own views that he seems to the reader to have no system himself, this writer has lamentably failed, for everything historical is colored by the author's opinion. Moreover, there is no one else in the world who would define the field of philosophy as this writer has done, still less give the topics he includes the same perspective. Are not works like this still in what Hegel called the animal kingdom of mind? Do they not represent a kind of self-indulgence which in our age of science ought to be past? The strange amalgam of theory and sentiment in regard to such problems as the self and evolution may give a certain amount of orientation to novices, but there is too much indoctrination. The whole book might have had the title of one section, viz., "My Own Standpoint."

The psychology of conviction; a study of beliefs and attitudes. By JOSEPH JASTROW. Boston, Houghton Mifflin Co., 1918. 387 p.

The author has chapters on the feminine mind, belief and credulity, the case of Paladino, militarism and pacifism, "malicious animal magnetism," the psychology of indulgence, the psychology of conviction, fact and fable in animal psychology, the democratic suspicion of education, the will to believe in the supernatural, and antecedents of the

study of character and temperament. Most of these papers are reprints from various magazines. The author writes fluently, perhaps too fluently, but it is unfortunate that he betrays no knowledge of the best literature in quite a number of the fields he treats, and this gives to not a few of his conclusions and presentations a touch of triteness, at least for the expert who knows. The time has gone past for general psychology. Everyone who would be an author now must limit himself to a single and small portion of the field. Books like this are a survival of a stage of psychologizing that is rapidly passing.

The gate of remembrance. The story of the psychological experiment which resulted in the discovery of the Edgar Chapel at Glastonbury. By FREDERICK BLIGH BOND. Oxford, Blackwell, 1918. 176 p.

The green isle of Glaston, isolated by a girdle of marsh and mere, was once a haunt of peace. Here were the first Christian missionaries, who evangelized Britain. There were later waves of pagan immigration, but the lamp of truth was never extinguished. The heritage of Glaston was not that of an individual but of all. Here lies the dust of many holy men. Kings made her great. In 1539 it was surrendered and the last abbot executed. The art treasures were dispersed, and nothing more was heard of Edgar Chapel. Perhaps it was one of the first buildings to be utterly destroyed and even its memory was almost gone, save a few traces in local tradition; but in 1908 came a discovery by the psychic researchers and the record here is compared with such traces as history has left us.

Psychology and preaching. By CHARLES S. GARDNER. New York, Macmillan Co., 1918. 389 p.

Psychology has often been applied to teaching, but here it is applied to preaching, thus undertaking to do for preachers what educational psychology does for the pedagogue. The author treats the mental processes involved in preaching, after a general discussion of mental processes, and then he takes up the psychology of the mass as they appear in assemblies and community groups, then three occupational types, the minister, the laborer, and the business man. He then discusses modern mind or the peculiar attitudes of modern men as contrasted with more primitive men. It should interest not merely preachers but all who care for religious problems and indeed public speakers generally ought to find new points in it.

Psychical phenomena of the war. By HEReward CARRINGTON. New York, Dodd, Mead & Co., 1918. 363 p.

In these papers the author tries to study the psychological forces at work in the present war, and divides his book into two parts, one dealing with psychology proper, applied to the mind of nations and of individuals, and the other to psychical or supernormal phenomena of a largely spiritistic character. Thus Part I studies the mind of the soldier up to the point where he is killed in action, while "Part II" continues our study of the same soldier after his death. We thus extend our inquiry into the realms of the vast beyond and seek to bring back from that unknown land definite knowledge of those who sojourn there. For the first part the author leans a good deal upon Le Bon and Crile. The best article in the book is a reprint of the author's "The Mind of the Soldier," from the Forum for January, 1916.

The language of color. By M. LUCKIESH. New York, Dodd, Mead and Co., 1918. 282 p.

There is a lack of correlation between the sciences and the arts, which is due to the difficulty of an individual in adapting himself to these two viewpoints. The author accordingly divides his work into four parts, as follows: Part I, mythology, association, nature, primitive language, literature, painting, ecclesiasticism, theatre; Part II, symbolism of color, red, yellow, green, blue, white, black, gray, various colors; Part III, nomenclature, psycho-physiology of colors, color preference, affective value of colors, attention value of colors; Part IV, esthetics, harmony, color practice, color-music, finale, and bibliography.

Cours de psychologie et de philosophie. I. Psychologie. By E. BAUDIN. Paris, Ancienne Librairie Poussielgue, 1917. 618 p.

The author treats the following topics: three psychologies; the object of psychology; physics and morals; method of psychology; determination of psychological laws; attention; habit; conscience; self; sensation in general; sensations; perception of movement, space and time; images; association; memory; perception; imagination; what is thinking; the idea; judgment; reason; the reason or the principal directors of knowledge; belief; language; the inclinations; pleasure and pain; emotions; passions; character; instinct; psychological automatism; will; liberty.

The Stanford revision and extension of the Binet-Simon scale for measuring intelligence. By LEWIS M. TERMAN and others. Baltimore, Warwick and York, 1917. 179 p.

This monograph summarizes the data on which the Stanford revision and extension of the Binet scale rests and gives an analysis of the results secured by the application of the revised scale with nearly a thousand unselected school children. The complete guide for giving and scoring the tests and for the interpretation of results is published separately ("The Measurement of Intelligence") so that these two volumes belong together.

The mental survey. By RUDOLF PINTNER. New York, D. Appleton and Co., 1918. 116 p.

This work is an attempt to develop a method of tests for large groups. In discussing the tests and their standardization, the author treats more specifically the computations and the results, the surveys of schools, the survey tests and other estimates of intelligence, and educational accomplishment and mental ability. Part II consists of a guide for the use of the survey tests.

Dynamic psychology. By ROBERT SESSIONS WOODWORTH. New York, Columbia University Press, 1918. 210 p.

This work treats of the modern movement in psychology, the problems and methods of psychology, native equipment of man, acquired or learned equipment, the factor of selection and control, the factor of originality, drive and mechanism in abnormal behavior, drive and mechanism in social behavior.

Manual of vital function testing methods and their interpretation. By WILFRID M. BARTON. Boston, Richard G. Badger (1917), 2d ed. 318 p.

Save for this book function tests bearing on the diagnosis of diseases of the heart, kidney, liver, pancreas and ductless glands have

remained scattered in medical journals of many languages, but this manual attempts to bring this important material together. It is a most timely book.

Essai sur l'introversion mystique; étude psychologique de pseudo-Denys l'Areopagite et de quelques autres cas de mysticisme. By FERDINAND MOREL. Genève, Librairie Kundig, 1918. 338 p.

The author first considers the psychology of the pseudo-Dionysius the Areopagite, beginning with an historic orientation and a resumé of the symptoms, rite, myth, ecstasy, and metaphysics of Dionysius. The second part treats of the introversion of Oriental, of spiritual, and of orthodox mystics—these three.

The influence of age and experience on correlations concerned with mental tests. By EDWARD SAFFORD JONES. Baltimore, Warwick and York, 1917. 89 p.

The Witmer cylinder test. By FRANKLIN C. PASCHAL. Hershey, Pa., Hershey Press, 1918. 54 p.

Experimental tests of mathematical ability and their prognostic value. By AGNES LOW ROGERS. New York, Teachers College, 1918. 118 p.

The picture completion test. By RUDOLF PINTNER and MARGARET M. ANDERSON. Baltimore, Warwick and York, 1917. 101 p.

Report on some measurements in spelling in schools of the Borough of Richmond, City of New York. Issued by the Division of Reference and Research. EUGENE A. NIFENECKER, Assistant Director, 1917. 88 p.

The psychology of special disability in spelling. By LETA S. HOLLINGWORTH, assisted by C. Amelia Winford. New York, Teachers College, 1918. 105 p.

Training pupils to study. By H. B. WILSON. Baltimore, Warwick and York, 1917. 72 p.

Memory and the learning process. By DARWIN OLIVER LYON. Baltimore, Warwick and York, 1917. 184 p.

Footnotes to formal logic. By CHARLES H. RIEBER. Berkeley, University of California Press, 1918. 177 p.

Nine humorous tales. By ANTON CHEKHOV. Tr. by ISAAC GOLDBERG and HENRY T. SCHNITTKIND. Boston, Stratford Co., 1918. 60 p.

1. The first part of the document is a list of the names of the persons who have been appointed to the various offices of the city of New York.

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THE INFLUENCE OF MENTAL WORK ON THE VISUAL MEMORY IMAGE.

By ANNA BERLINER.

First Series:

The problem is the comparison of the mental image in the morning and at night. The experiments were made before the observer started his mental work or a short time after starting, and were repeated after a day's mental work. One morning experiment and one night experiment were always made on the same day. In the morning as well as at night the experiments were carried on in the following way. A certain drawing¹ was exposed five seconds. Then the observer closed his eyes and waited thirty seconds in order to avoid after-images of the drawing and of stimuli which might excite him by chance. The observer was told not to think of the picture during the thirty seconds. The experimenter generally tried to distract him by inquiring about the work the observer had done before the experiment. At the end of the thirty seconds the signal "Try to call it up now," was given. The signal was given so that "now" followed one second after "try." The observer then tried to call up the memory image. As soon as he succeeded in seeing it, he pressed a key. The instant the image disappeared he released the key. The pressing and releasing of the key was recorded by a pointer on a kimograph. Time was measured by a metronome. The instruction given to the observer was: "Press the key as

¹ The drawings are described on p. 357.

soon as you *see* anything of the image at all, and only if you *see* it." The first time the instruction was given the experimenter asked if the observer was able to distinguish between *thinking* of the image and *seeing* it. The observer generally found no difficulty in making this distinction. Each time an observer was doubtful as to whether he really saw the image or only thought of it, a note was taken. The observation² took thirty seconds, at the end of which time a short introspection was required. There was no special instruction given for the introspection. The experimenter was afraid that any question might be suggestive, and therefore asked only for introspection as such. At each sitting the observation was repeated three times. There was a difference, however, between the first observation and the second and third, in that the drawing was not exposed again to the observer. The time between the second and first as well as between the second and third observation was determined by the duration of the introspection.

It is evident that the first observation takes place under conditions different from those of the second and third observation. It is improbable however that the first observation has to do with the so called primary memory image or memory after-image, as it is usually assumed that the primary memory image does not last longer than 20 or 30 seconds.³ The motive for making the first observation different from the two succeeding observations was to observe the influence of mental work on the memory image under different conditions. We chose the long exposure of five seconds in order to be sure of a thorough acquaintance with the picture. The experiments are not memory experiments but experiments about the mental image. The special kind of mental image, memory image, was decided upon, because it allows greater control of experimental conditions than the imagination image.

Eight observers (*A, B, C, D, E, F, G, H*) took part in the series. One of the observers was an instructor, five were graduate students, and two were undergraduates of Columbia University. *A, B, C, D* served throughout the whole experi-

² When we speak in the following about an observation we always mean observation as described here. Thus the time the observer keeps the images during an observation is different from the time a single image lasts unless the observation contains only one image.

³ J. W. Slaughter, "A Preliminary Study of the Behaviour of Mental Images," *Am. Jour. Psychol.*, 1902, 13, p. 530, and Alma de Vries Schaub, "On the Intensity of Images," *Am. Jour. Psychol.*, 1911, 22, p. 354.

ment (five times), including both morning and evening sittings. As each experiment comprises three observations, each of these subjects observed fifteen times in the morning and fifteen times at night. Observers *E, F, G, H* performed only three morning and three night experiments each, thus observing nine times in the morning and nine times at night. Altogether 192 observations were recorded.

In the experiments with *A, B, C, D, G,* and *H* the picture used as stimulus was a simple geometrical figure, red with black outlines. It was the figure which is obtained by drawing three half circles around three equidistant points of a circle, using the radius of the original circle for the three half circles. The radius was 2 cm. The coloring was done by crayons. It seemed desirable to find how far the results obtained with this picture were independent of the special drawing. Three pictures were therefore devised which differed from the first in the following respects. Whereas the first picture was a purely geometrical figure, the three other pictures were drawings of objects. Whereas the first picture was red, the three other pictures showed as main coloring green or blue or yellow. The second picture, representing a leaf, had, like the first only one color besides the black outline. The third picture, a duckling, had a yellow body, red feet and beak, and a faint green base. The last picture was a blue flower with a yellow centre. The first picture was used for all observers with the exception of *E* and *F*. Observers *E* and *F* were shown picture 2 on the first day, picture 3 on the second day, and picture 4 on the third day. It must be admitted that the conditions for the morning and night experiments were not the same in the experiments with the last two observers. The picture when exposed in the morning was an unknown one, whereas it was familiar to the observer at the beginning of the night experiment. In the experiments with picture 1, the same picture was used over and over again; and from the second day on, it was already familiar in the morning experiment. As no difference was found between the experiments where only one picture was used, and the experiments where a different one was used every day, we are justified in neglecting this irregularity in the experiments with changing pictures.

The time which intervened between the morning and night experiments was for observer *A*, 9 hours; for observer *B*, 12 hours; for observer *C*, 6 hours; for observer *D*, 8 hours; for observer *E*, 8 hours; for observer *F*, 10 hours; for observer *G*, 8 hours; and for observer *H*, 7 hours.

The fact that the results for the arousal are much less regular than those for the duration is in harmony with a remark of Burt: "It may be noted in passing that the whole series of experiments on imagery indicates that the time of holding is a much better criterion by which to judge the influence of various factors upon imagery, than is the time of arousal."⁴

Another way to compare the different factors with regard to their sensitiveness as indicators of mental work is to consider the ratios of the figures from the morning and night experiments of all observers together. Table 4 gives the figures for the first, second and third observations, and their sum for all observers. As the time for the arousal is longer at night than in the morning, we have to take the reciprocal values (as indicated in parenthesis) in order to make a comparison possible. We find little difference between the ratio for the time the image is kept and the duration of the single image. We notice, however that the ratio is somewhat steadier for the time the image is kept since the deviation for the first, second, and third observation is $-8, 0, +7$, whereas it is $-7, -6, +16$, for the duration of the single image. Contrary to our expectations from the first three tables, the time for the arousal of the first image is a better indicator than the time the image is kept and the duration of the single image. The ratio of the sums is as high as 1.72. The explanation lies in the fact that the time for the arousal does not differ regularly in the morning and night experiments, but once being different at all, generally shows a great difference.

Another way of comparing the sensitiveness of the different factors in regard to the influence of mental work is the percentage of experiments that show the one or the other of the factors influenced by the mental work. The time the image is kept is longer in the morning than at night in 87.5% of the experiments, shorter at morning than at night in 12.5%. The same relation obtains with the duration of the single image; 87.5% of the experiments give smaller figures in the morning and 12.5% give smaller figures at night. The number of images is found to be smaller at night in 50.0%, larger at night in 41.0% and equal in 9.0%. The time necessary for the arousal of the first image is in 69.0% shorter, in 28.0% longer and equal in 3.0%. These figures support the result gained before i. e. that the time the image is kept and the duration of the single image are equally sensi-

⁴ Harold E. Burt, "Factors which Influence the Arousal of the Primary Visual Memory Image." *Am. Jour. Psychol.*, 1916, 27, p. 96.

tive factors with regard to the influence of mental work. The number of images is hardly influenced at all. The time the image is kept in one observation, the duration of the single image, and the number of images are not independent factors, but limited by the relation

$\frac{\text{time the image is kept}}{\text{number of images}} = \text{duration of the single image.}$ Thus

as long as the number of images is not influenced by the mental work the time the image is kept and the duration of the single image must be equally sensitive factors. On the other hand, in so far as the duration of the single image is less sensitive than the time the image is kept in one observation, the number of images shows the influence of the work. The last factor, the arousal of the first image, shows quite a considerable surplus of cases with quicker arousal in the morning. It is, however, not as good an indicator as the duration of the images. This fact supports the explanation given above for the discrepancy between the figures of the first three tables and those of the fourth table. The arousal is not always influenced, but, once having been affected, shows this influence stronger than any of the other factors.

Giving the figures for the first, second, and third observations separately, Table 4 allows a comparison of those three different observations. As already mentioned, only the first observation of each experiment was preceded by an exposure of the objective picture. The observation followed thirty seconds after the exposure. The other observations followed as soon as the introspection was finished. We find that the ratios for the first, second, and third observations increase from the first to the second, and from the second to the third in the columns for the time the image is kept, as well as in the columns for the duration of the single image. Those columns that give the number of images do not allow any comparison because they vary in an irregular way and only slightly from 1. Apparently the data for the arousal of the first image follow the same regularity as those of the columns for the time the image is kept and the duration of the single image. But this regularity is only apparent. The smaller the ratio, the greater is the difference between the morning and the night experiment. Thus while for the time the images are kept and the duration of the single image the first observation is less sensitive than the second, and the second less than the third, we find the opposite results with the time for the arousal of the first image. Here the third observation is a better indicator than the second, and the second better than the first.

In order to see if the ratio is influenced by practice we separate observer *A*, *B*, *C*, and *D* who went through five experiments from *E*, *F*, *G*, and *H* who performed only three experiments. Table 5 gives the ratio for the time the image is kept in the first two rows. The first row contains the quotient of the sums of *A*, *B*, *C*, and *D*'s figures. The second row shows the ratio of the sums of *E*, *F*, *G*, and *H*'s figures. In the same way the third and fourth row give the duration of the single image, and the fifth and sixth row the ratios for the time necessary to arouse the first image. We find neither a decrease nor an increase.

It may be noticed in passing that this arrangement too yields only ratios that are greater than 1. This means that if we combine the figures for all observers for a single day we always obtain for the time the image is kept and for the single image a greater duration in the morning than at night, and for the time necessary to call up the first image, a longer duration at night than in the morning. It will be understood that Table 5 gives the reciprocal values for the arousal of the image; this means that the ratio is found by dividing the evening value by the morning value.

The number of observers is too small to justify general conclusions regarding the influence of the number of working hours between the morning and the evening observations, on the difference of the results. It is nevertheless quite interesting to compare the data in relation to this factor. If x is the average of the duration of the images in the morning,

and y that of the images at night, then $\frac{x+y}{x-y}$ will be smaller

the greater the difference of x and y . This quotient will be a definite value for each observer. A second value for each observer is found in the number of hours that passed between the morning and evening observation.⁵ If we correlate these two series of values according to the product-moment's method of Pearson (omitting observer *G*, in regard to which see table 2) we obtain $r = -0.50$, with a probable error ± 0.19 .⁶ The coefficient suggests that the greater the time interval the greater the difference between morning and evening

⁵ It is evident that the number of hours passed between the two experiments is no correct measure for the work done. Most of the hours were spent studying, going to lectures or lecturing. But occasionally the observer reported a walk or some other rest between.

⁶ If we take $\sigma = \sqrt{\frac{\sum (d)^2}{r-1}}$ instead of $\sqrt{\frac{\sum (d)^2}{r}}$, $r = -0.41$.

observation. Including observer *G* we obtain the coefficient $r = -0.18,$ ⁷ with a probable error of ± 0.23 .

It might be objected that the difference between the morning and night experiments is not caused by differences in the subjects but by difference in the light. A great part of the experiments at night was carried on by artificial light, whereas natural light was generally used in the morning. Observer *H*, however, did all experiments by natural light; and her data do not differ from those of the other subjects. This fact suggests that the differences are not due to different light. Even if we assume that it was somewhat darker in the afternoon experiments than at morning the probability of getting better images at night would be greater than the opposite. Wundt states that "unsere Erinnerungsbilder sind im Dunkeln oder Halbdunkel ungleich lebendiger als im Licht des Tages."⁸

Qualitative Results:

If we compare the images in regard to color, shape, outline, clearness, vividness, and ease of evocation, we find only three observers whose images before the mental work and after the mental work differ markedly in most of these respects. They are observers *B*, *E*, and *H*. Even with these observers, not every image in the morning observation was good nor every image in the evening observation poor. But in general the images were better in the morning. With observer *B*, the most conspicuous fact is that he found it very hard to call up an image at night. "I could not get it at all, it was very hard to call it up." "I could not get a thing, perfectly blank." "It was just a sort of brown all over, not sharp outlines as this morning," were his reports. No remark of that kind occurred in the morning observations. The images at night were not only hard to call up, but they were vague, blurry, and poor in colors. "No color or anything, just vague blur." Observer *E* too had great difficulty in getting any color at night. "It did not have the color characteristics, and I could not get them although I kept thinking of black and green." "I could not seem to get any color there. It was just a shadowy bird, a grayish bird." We find quite a different introspection in the morning observations. "The yellow centre seemed to stand out most sharply; it was a

⁷ For $\sigma = \sqrt{\frac{\sum (d)^2}{r-1}}$, $r = -0.16$.

⁸ W. Wundt, *Elemente der Völkerpsychologie*, 1912, p. 25.

more saturated yellow than in the original," is typical of the replies. The difference in the other qualities is not quite so conspicuous as that of the coloring but nevertheless stands out quite clearly. I quote a few more descriptions given by *E* in the night experiments. "That was so exceedingly faint and indefinite when I got it that I am almost inclined to doubt if it was an image at all." "It was a fluctuating shadow; it did not have any sharply defined circumference." A few morning introspections follow: "I had no difficulty at all in getting a splendid image. I never lost it completely. It just seemed to become a little fainter, and then become very clear again." "I immediately got a very satisfactory image, and it remained." "It seemed to be a perfect representative of the objective design." Observer *H* shows the same marked difference in colors as observer *E*. She mentioned color only once at night and on that occasion she reported only: "Not much color." There is on the other hand, not a single morning observation without color. Reports ran, "The colors were very bright," or "The colors were very clear and vivid." She too found it hard to call up the image at night. In only one night observation do we find that it was not hard to call up the image, whereas we find several morning introspections like the following: "I found it awfully easy to call the image up." "Easy to get the image." Her images were in general distinct and clear in the morning and indistinct and fluctuating at night. "It was not nearly as clear as in the morning." Observer *A*'s images were poor in the morning as well as at night. The only difference seems to be that she very often describes her images at night as fleeting. There is only a very slight difference with *F*, and it is doubtful if there is any difference at all with *C*, *D*, and *G*.⁹

Before concluding series *I*, two observations may be pointed out which although not connected with our problem, are of interest for the psychology of the visual memory image. The time the image is kept is longer in the first than in the second observation, and longer in the second than in the third observation. This obtains for the morning as well as the night experiment. The same regularity is repeated in the night experiments for the duration of the single image.

⁹ On the whole our experiments do not agree with Murray's results: "It soon became evident...that distinction and vividness were more constant and more significant factors than mere duration and recurrence." E. Murray, "Peripheral and Central Factors in Memory Images of Visual Form and Color." *Am. Jour. Psychol.*, 17, 1906, pp. 227 f.

The morning experiments, however, yield only the result that the first observation is superior to the average of the two following observations. Again the number of images does not show any regularity. The time for the arousal increases from the first to the second and from the second to the third observation, thus proving like the duration, that the first observation is superior to the second and the second to the third.

The second remark concerns the effect of practice. Table 6 separates those observers that observed only three times from those that observed five times. The table gives the time the images are kept and the time necessary for the arousal of the first image. The figures for the subjects that observed only three times seem to suggest some practice effect but this suggestion is not supported by the subjects that observed five times. This result is in harmony with Foster's remark: "In no case did practice increase the ability or even the tendency to visualize."¹⁰ Since the subjects that observed five times are more reliable than the other observers, it is even possible to see in Table 6 an indication that the mental image deteriorates with practice. This would support the often stated laboratory experience that the more an observer occupies himself with mental imagery the harder he finds it to call up a satisfactory image.

Second Series:

The problem here is the comparison of the visual memory image before and after a short time of intensive mental work. The intensive work consists in adding after Starch's method.¹¹ The adding was done for half an hour. The observer was told to do the adding as correctly and as quickly as possible. One undergraduate student of California and one graduate student of Columbia University took part in the experiment. The experiments in general were carried on in the same way as those described in the first series. The main difference lies in the fact that we compare the observations before and after the adding instead of those in the morning and at night. One of the observers (*I*) performed

¹⁰ W. S. Foster, "The Effect of Practice upon Visualizing and upon the Reproduction of Visual Impressions." *Jour. Ed. Psychol.*, 1911, 2 p. 11.

¹¹ "The experimenter announced to the observer a number consisting of two digits. The observer then added 6 to this number, then 7 to the new sum, then 8 to that, and then 9, and then again 6, 7 8, and 9 in rotation...." D. Starch, *Experiments in Educational Psychology*, pp. 36 f.

one observation before and one after the adding. The other observer (*K*) observed twice before and twice after the adding. The results are given in Table 7. They show:

1. *The time the images are kept during one observation is longer before than after the work.*

2. *The average duration of the single image is longer before than after the work.*

3. *The number of images tends only very slightly to be larger before than after the work.*

4. *The time for the arousal of the first image is in one case much shorter before than after the work; in the other case it is not influenced at all by the work.*

So far as two observers allow a generalisation, the results show that mental work tends to vitiate the visual memory

TABLE I

1	2	3	4	5	6
Observer	Number of observations	Average time the image is kept in one observation	Average duration of the single image	Average number of images	Average time for the arousal of the first image
A	15	8.2 (1.6)	1.2	6.6 (0.8)	1.8 (0.8)
	15	5.2 (1.1)	0.9	6.1 (0.9)	1.9 (0.8)
B	15	18.6 (2.4)	8.7	2.1 (0.6)	5.2 (1.1)
	15	4.5 (2.7)	2.8	1.6 (1.0)	16.8 (7.3)
C	15	9.5 (4.3)	1.7	5.7 (2.3)	6.9 (6.4)
	15	7.6 (3.2)	1.6	4.7 (1.4)	5.0 (4.0)
D	15	24.3 (1.8)	5.7	4.3 (0.8)	0.7 (0.4)
	15	22.0 (3.9)	5.1	4.3 (1.2)	0.6 (0.3)
E	9	17.1 (4.9)	4.9	3.5 (1.1)	4.9 (2.6)
	9	8.9 (3.4)	2.7	3.3 (1.0)	10.8 (4.8)
F	9	25.2 (1.1)	6.3	4.0 (0.6)	1.9 (0.5)
	9	21.1 (2.0)	4.0	5.2 (1.4)	2.8 (0.5)
G	9	6.8 (3.2)	1.1	6.1 (0.8)	0.8 (0.3)
	9	6.7 (3.7)	1.0	6.9 (1.0)	0.8 (0.4)
H	9	9.9 (3.5)	2.3	4.3 (0.5)	3.0 (0.9)
	9	6.2 (1.1)	1.2	5.1 (0.6)	5.7 (0.9)

image; this result agrees therefore with our first series of experiments. In regard to the sensitiveness of the different factors, too, this series supports the results of the first series. The time the image is kept and the duration of the single image are the best indicators for the influence of the mental work on the image. The number of images hardly shows any influence at all, and the time necessary for the arousal is very unreliable. Here again those factors that are fine indicators, the duration of the single image and the time the image is kept, are more sensitive in the second than in the first observation.

As in the case of our first series, so here too we find a few observations that do not pertain to the problem in question, but are of interest for the psychology of the memory image. Comparing the first and the second observation of

TABLE 2

1	2	3	4	5	6
Observer	Number of observations	Average time the image is kept in one observation	Average duration of the single image	Average number of images	Average time for the arousal of the first image
A	5	9.0 (1.4)	1.3	6.8 (1.0)	1.8 (0.8)
	5	5.4 (1.1)	0.9	5.8 (0.6)	1.2 (0.4)
B	5	17.9 (2.3)	8.1	2.2 (0.6)	5.2 (1.2)
	5	6.4 (3.9)	3.6	1.8 (1.0)	16.6 (8.0)
C	5	9.3 (4.3)	1.7	5.6 (1.9)	4.3 (2.4)
	5	6.4 (3.9)	1.5	4.4 (1.3)	6.0 (4.6)
D	5	24.1 (1.9)	6.0	4.0 (0.8)	0.9 (0.4)
	5	22.5 (4.4)	6.3	3.6 (0.7)	0.7 (0.5)
E	3	18.2 (1.8)	5.5	3.3 (0.4)	3.3 (1.1)
	3	11.7 (3.8)	3.2	3.7 (1.1)	6.5 (1.7)
F	3	26.7 (0.6)	6.7	4.0 (0.7)	1.5 (0.3)
	3	22.2 (2.2)	4.1	5.3 (1.8)	2.2 (0.2)
G	3	4.5 (1.3)	0.8	6.0 (0.0)	1.0 (0.3)
	3	7.0 (3.3)	0.9	7.7 (1.1)	1.3 (0.5)
H	3	11.3 (3.3)	2.6	4.7 (0.6)	2.2 (0.2)
	3	6.0 (0.8)	1.1	5.3 (1.3)	6.7 (0.5)

observer *K* we find that the image is poorer in the second observation than in the first. This difference obtains throughout, and for the experiment before the adding as well as for that after the adding. Comparing the different days we see that there is neither a decrease nor an increase of the time the image is kept in one observation (Table 8).

TABLE 3

1	2	3	4	5	6
Observer	Number of observations	Average time the image is kept in one observation	Average duration of the single image	Average number of images	Average time for the arousal of the first image
A	10	7.8 (1.6)	1.2	6.6 (0.7)	1.8 (0.6)
	10	5.2 (1.1)	0.8	6.4 (1.2)	2.1 (0.9)
B	10	18.9 (2.4)	9.0	2.1 (0.5)	5.3 (1.2)
	10	3.6 (2.1)	2.4	1.5 (1.0)	17.0 (6.7)
C	10	9.6 (4.5)	1.7	5.7 (2.5)	8.3 (8.5)
	10	8.2 (3.3)	1.7	4.8 (1.4)	4.5 (3.8)
D	10	24.4 (1.7)	5.6	4.4 (0.8)	0.6 (0.3)
	10	21.6 (3.5)	4.6	4.7 (1.3)	0.6 (0.3)
E	6	16.7 (6.3)	4.8	3.5 (1.3)	5.8 (3.1)
	6	7.6 (2.4)	2.4	3.2 (0.8)	13.0 (5.8)
F	6	24.5 (0.8)	6.1	4.0 (0.8)	2.1 (0.6)
	6	20.6 (1.6)	4.0	5.1 (1.2)	3.1 (0.3)
G	6	8.0 (4.0)	1.1	6.2 (1.2)	0.6 (0.5)
	6	6.5 (3.8)	1.0	6.5 (0.8)	0.6 (0.3)
H	6	9.1 (3.1)	2.2	4.3 (0.5)	3.3 (0.8)
	6	6.3 (1.3)	1.2	5.0 (0.4)	5.2 (0.7)

TABLE 4

Observation.		1	2	3	Σ
Time the image is kept;	morning	483.50	479.50	475.24	1438.25
	night	344.25	323.00	307.00	974.25
	ratio	1.40	1.48	1.55	1.48
Duration of the single image;	morning	3.31	3.15	3.30	9.76
	night	2.39	2.27	2.05	6.71
	ratio	1.38	1.39	1.61	1.45
Number of images;	morning	146	152	144	442
	night	144	142	150	436
	ratio	1.01	1.07	0.96	1.01
Time for the arousal of the first image;	morning	84.50	100.00	130.50	315.00
	night	171.75	180.00	189.75	541.50
	ratio	0.49	0.56	0.69	0.58
		(2.08)	(1.78)	(1.45)	(1.72)

TABLE 5

Day:		1	2	3	4	5
Time the image is kept	(A, B, C, D)	1.60	1.48	1.41	1.44	1.85
	(E, F, G, H)	1.44	1.22	1.43	.....	.....
Duration of the single image	(A, B, C, D)	1.27	1.05	1.55	1.42	1.58
	(E, F, G, H)	1.85	1.25	1.64	.....	.....
Time necessary for the arousal	(A, B, C, D)	1.40	2.01	1.06	1.31	2.45
	(E, F, G, H)	2.02	1.68	2.02	.....	.....

TABLE 6

Day		1	2	3	4	5
Time the images are kept	Morning	187.50	183.75	171.75	177.75	187.00
	Night	117.25	124.25	121.75	123.25	101.75
	Σ	304.75	308.00	293.50	301.00	288.75
Arousal	Morning	30.00	34.75	54.50	51.00	49.50
	Night	42.00	70.00	57.50	66.75	122.25
	Σ	72.00	104.75	112.00	117.75	171.75
Time the images are kept	Morning	167.75	137.75	224.25	.....	.....
	Night	116.75	112.75	156.50	.....	.....
	Σ	284.50	250.50	380.75	.....	.....
Arousal	Morning	40.25	33.75	21.25	.....	.....
	Night	81.25	56.75	43.00	.....	.....
	Σ	121.50	90.50	64.25	.....	.....

Time is given in seconds. The figures represent the sums of A, B, C, and D in the upper half, and the sums for E, F, G, and H in the lower half.

TABLE 7

Observer		Number of observations	Average time the image is kept	Average duration of the single image	Average number of images	Average time necessary for the arousal of the first image
I. before the work:		6	14.4 (3.6)	12.4	1.1	7.5
	after the work:	6	7.2 (2.9)	7.2	1.0	12.8
	ratio:		1.96	1.72	1.1	1.71*
K before the work:						
	first observation	5	6.4 (1.2)	1.0	6.6	1.9
	second observation	5	4.6 (0.9)	1.0	5.6	3.4
	$\Sigma : 2$		5.5	1.0	6.1	2.65
	after the work:					
	first observation	5	5.6 (1.0)	0.9	6.0	2.6
	second observation	5	3.9 (0.4)	0.7	5.4	2.7
	$\Sigma : 2$		4.75	0.8	5.7	2.65
	ratio:					
	first observation		1.14	1.11	1.1	0.73*
	second observation		1.18	1.43	1.04	1.26*
	Σ		1.16	1.25	1.07	1.00

Time is given in seconds. The figures in parenthesis give the average deviations. The figures with the * are gained by dividing the figures after the work by the figures before the work.

TABLE 8
TIME THE IMAGES ARE KEPT

Observer: Day:	1	2	3	4	5	6
I. before the work:	15.00	22.50	7.50	11.00	16.50	13.50
after the work:	6.00	14.50	7.00	6.00	1.00	8.50
K. before the work:	4.75	14.25	4.50	6.75	4.75	.....
after the work:	5.25	4.75	6.00	4.00	4.00	.....
Σ before the work:	19.75	36.75	12.00	17.75	21.25	.....
Σ after the work:	11.25	19.25	13.00	10.00	5.00	.....
$\Sigma \Sigma$:	31.00	56.00	25.00	27.75	26.25	.....

TABLE 8—Continued
AROUSAL OF THE FIRST IMAGE

Observer: Day:	1	2	3	4	5	6
I. before the work:	9.50	2.50	7.00	12.00	5.50	11.50
after the work:	9.50	10.50	18.00	10.50	12.00	16.50
K. before the work:	1.25	2.00	3.00	4.00	2.25	.....
after the work:	1.25	3.00	2.25	4.25	2.25	.....
Σ before the work:	10.75	4.50	10.00	16.00	7.75	.....
Σ after the work:	10.75	13.50	20.25	14.75	14.25	.....
$\Sigma \Sigma$:	21.50	18.00	30.25	30.75	22.00	.....

THE THEORY OF RECAPITULATION AND THE RELIGIOUS AND MORAL DISCIPLINE OF CHILDREN

By WESLEY RAYMOND WELLS, Washington University

There is no such thing as a modern infant. The modern individual begins his career at precisely the same point at which each cave-man started. Only in the world of mythology does an individual spring forth, like Minerva, full-fledged in wisdom. In the actual world a long period of infancy, childhood, and youth must precede intellectual and moral, as well as physical, maturity. Present-day studies in genetic psychology have begun to reveal the real needs of the child, needs that are not at all the needs of the adult. Just as the infant's physical food is not that of the adult, so the intellectual, moral, and religious pabulum of the child is not properly that of the mature individual. Psychology gives us a scientific basis for requiring the child to speak, understand, and think as a child, while expecting the man to put away childish things.

Especially in the field of religious education is it imperative to take into account the needs of childhood and youth, and it is precisely these early religious needs that have been persistently ignored. As President Hall says,¹ "From the old New England Catechism to President Eliot's latest pronouncements reducing religion to ethical culture, American educators have to an extraordinary degree ignored the nature and the highest needs of the child, and persistently assumed that whatever was good for them was, of course, good for him."

There is little agreement as to just what the child's religious needs really are. The only certain way of learning the best methods of education is that of observation and experimentation. In religious education, however, there has been very little unprejudiced observation, as yet, and still less experimentation; but, in the meantime, while we are learning religious educational psychology, society has the immediate task of educating its youth. Consequently partially verified hypotheses must be adopted tentatively and tried out. Among these partially verified hypotheses is that known as the theory

¹ G. Stanley Hall, *Educational Problems*, Vol. I, p. 146.

of recapitulation, or the biogenetic law. This theory possesses its greatest value when applied to the problem of religious and moral education. According to this theory the beliefs characteristic of the primitive religions would possess value for the child, while only later in his development would the teachings of the higher religions become suitable.

My purpose in discussing the value of religious beliefs in individual development, beliefs of different kinds for different stages of development, is to combat two tendencies in present-day practice. One modern tendency is to give the child and youth absolutely no religious instruction. Many parents who have no religious beliefs themselves oppose the teaching of religion to their children on the ground of its untruth. If, as Professor Leuba has shown,² the majority of scientists do not believe in even the most essential of religious objects, God and immortality, it is probable that many of them would oppose the teaching of religion to children for the reason that, as they think, religious beliefs are false. Against such a view I would urge the teaching of religion for reasons of its value, regardless of its truth. Another class, the class of religious believers, would, in many instances, teach children the very same religious views that they think fit and proper for adults; and I would urge against this tendency the fact that the religious needs of the child are not the same as the religious needs of the adult.

I

The similarity between early human embryonic stages and lower forms of life was observed by embryologists early in the nineteenth century, and the theory of recapitulation was first clearly stated in its full evolutionary context by Fritz Müller in 1863, and then by Haeckel, under the name of "the fundamental law of biogenesis". Haeckel's statement of the law is as follows:³ "The rapid and brief ontogeny [the life history of the individual] is a condensed synopsis of the long and slow history of the stem (phylogeny): this synopsis is the more faithful and complete in proportion as palinogenesis [the reappearance or repetition of old, ancestral traits] has been preserved by heredity, and cenogenesis [deviation from the phylogeny of the group] has not been introduced by adaptation." This statement includes both the general law and its limitations. Each individual in its development repeats

² J. H. Leuba, *The Belief in God and Immortality*.

³ Ernst Haeckel (Joseph McCabe, translator), *The Evolution of Man*, Vol. II, p. 357.

its ancestral history, but not precisely. Many ancestral traits are lost, new traits appear, and there are numerous short-cuts.

Though it is not maintained by any biologists that the individual in all the details of its development climbs up the ancestral tree, still the theory in its broad outlines is accepted by practically all biologists. That this is true is shown by the fact that the theory is incorporated in the standard textbooks of biology and zoology. Human development, viewed in the light of this theory, is seen to be through stages represented ancestrally by the protozoa, by a radially symmetrical stage, by bilaterally symmetrical forms of life, by fish, by amphibia, and by simian forms, before the individual becomes relatively human at about the end of the second year. Such facts, unquestioned by biologists, are so significant that anthropologists and psychologists have carried the law of biogenesis further, to cover mental development through childhood and youth. There is not so clear a case for mental recapitulation, yet it is denied by few, and it is explicitly accepted by many. Thorndike⁴ is one who denies the applicability of the biogenetic law to human development, but his arguments against it are very inconclusive. He does little more than point out limitations of the theory, and everybody admits that the theory has limitations. Thorndike himself, however, accepts the theory in some cases.⁵ Baldwin,⁶ Hall,⁷ and Freud⁸ are among the most conspicuous psychologists who accept and employ the doctrine. President Hall perhaps carries it to somewhat extreme limits in many cases, and yet his application of it to religious education is of inestimable value. Mr. Guillet⁹ has made a thorough survey of the theory in its general application to education. Professor Coe¹⁰ employs the theory in his discussion of religious and moral education.

If not carried out in too extreme detail, the theory of recapitulation is of at least some service in explaining child

⁴ See E. L. Thorndike, *Educational Psychology*, Vol. I, *The Original Nature of Man*, Ch. XVI.

⁵ *Op. cit.*, Vol. II, p. 99.

⁶ J. M. Baldwin, *Mental Development in the Child and the Race; Social and Ethical Interpretations; A Genetic Theory of Reality*.

⁷ G. Stanley Hall, *Adolescence*, 2 vols.; *Educational Problems*, 2 vols.; and other works.

⁸ See especially Sigmund Freud (A. A. Brill, translator), *Totem and Taboo*, New York, 1918.

⁹ Cephas Guillet, "Recapitulation and Education," *Pedagogical Seminary*, Vol. VII (1900), pp. 397-445.

¹⁰ G. A. Coe, *Education in Religion and Morals*. See especially pp. 211-25.

development. In the first two or three years of life, the foetal stage included, the individual recapitulates the pre-human stages of evolution. Phylogenetically, pre-human stages represent an evolutionary period many times greater than the period during which man has existed. Yet we observe that the individual spends a much longer time recapitulating human than pre-human stages. This, however, is in accordance with the general operation of the biogenetic law. The oldest forms of racial life are recapitulated most rapidly, and the more recent ancestral forms, more slowly. The length of time taken to recapitulate a period does not depend upon the phylogenetic duration of the period so much as upon its recency in the ancestral series. It is to be expected, consequently, that the recapitulation of the human racial stage, representing perhaps a duration of a million years, should take a much longer time than the recapitulation of all the pre-human phylogeny, though this represents a period of many million years.

President Hall divides the stages of individual development into four periods, which he calls those of infancy, childhood, youth, and adolescence. The stage of infancy, lasting until the end of the second year, which has been called the simian stage, does not concern us now, nor does the fourth stage, of adolescence, occurring from the age of about thirteen to twenty-five or thirty, except the first few years of its beginning, for recapitulation does not occur after the beginning of adolescence. It is the stage of childhood, from two to eight, and that of youth, perhaps better called that of later childhood, lasting from eight to twelve or thirteen, that are of greatest importance for our immediate study. The age of childhood, with its imaginative activities, represents the savage stage, marked by a close relation to nature and a tendency to personify physical objects and to confuse the animate and the inanimate. The period of youth represents racially, according to President Hall, the culmination of a long line of savage development—a long and relatively stationary period in racial history. This is the age pre-eminently of physical activity and practical adjustment. In adolescence the stage of later civilization in the race gains ascendancy in the individual, and here the emotions tend to predominate.

The plan of education on a recapitulatory basis is to furnish to the developing individual, as far as this is possible, the appropriate environment for his stage of development. In religious education this means encouraging the natural succession of religious beliefs, just as they have occurred in the history of the race.

Religions may be divided historically into nature and redemptive religions. The chief distinction between the nature and the redemptive religions may be expressed in terms of the difference between human desires for satisfactions of a temporal and earthly sort, and desires for transcendent satisfactions. The earliest, pre-animistic forms of religion, the later forms, dominated by a generally animistic philosophy, both belonging to the tribal stage, and the later national, and more or less legalistic religions, such as are best illustrated by early Judaism, would all be included under nature religions. Early Judaism is a nature religion for in early Judaism Jehovah existed for the affirmation of "this world." Such religions as Zoroastrianism, Mohammedanism, Brahmanism, Buddhism, Judaism in its later development, and Christianity, are called redemptive religions. There is a clear and recognizable distinction between those religions in which gods are invoked to satisfy man's desires for material prosperity, and other religions that offer satisfaction to man's desire for "the peace that passeth understanding."

It is possible further to distinguish two classes within the nature religions, that is, the primitive and the morality religions. The morality religions, best exemplified by early Judaism, are still nature religions, but they have advanced beyond the stage of the primitive religions, because of the development and moralizing of the gods, and especially through the rise of some form of monotheism. There is a moral element in the primitive religions, *e. g.*, in taboo, but such a moral sanction is more or less incidental, and is clearly on a lower plane than the morality of the Mosaic code. Thus we may arrive at a three-fold classification of historical religions, like Siebeck's,¹¹ including (1) primitive, (2) morality, and (3) redemptive religions. Such a classification is best for furnishing a background for the recapitulation theory.

Roughly corresponding to the three stages of religious evolution in the race, there may be distinguished three stages of individual development. Childhood and the early part of what President Hall calls youth correspond to the stage of the primitive religions. The period of youth, especially the later part, corresponds to the stage of the morality religions. The beginning of adolescence marks the rise of the redemptive religions in the race. Such a correspondence, obviously, holds only in a general way. There are wide variations from it for individual differences are great. It is an ideal correlation,

¹¹ Cf. Hermann Siebeck, *Lehrbuch der Religionsphilosophie*, pp. 52-161.

which is never realized completely, but there is value in trying to approximate it.

Childhood and youth, according to the theory of recapitulation, are stages of external authority, for they correspond to times in racial history when the individual was wholly subject to taboo, to the "folk-ways," and to priestly control. During adolescence moral sanctions should lose their external character. Beliefs in taboos have their place in childhood, because of their moral influence; and in youth belief in a God of law, whose commands are right because commanded, likewise possesses positive moral value. A recapitulatory scheme of religious and moral education furnishes a basis for discipline in the early stages of development. Out of the imaginative nature worship of the child there should be allowed to grow a conception of a God who is the author of inviolable law. Belief in a stern God of law should only gradually give place to belief in a God of love at the time of the emotional awakening at the beginning of adolescence. However impracticable the theory may seem, since such discipline is implied by it, it has actually been practiced, deliberately or unconsciously, more extensively than is commonly supposed.

The early belief in taboos, and, growing out of this, the belief in God-given codes of law, are instrumental to the maintenance of desirable forms of conduct during early life, and to the formation of good habits that will persist after the disciplinary beliefs that once supported them have disappeared. As it was with the race, so it should be with the individual. Moral education should begin with taboo, and belief in a God of external authority is the strongest support of morality at the dawn of adolescence. As Partridge says,¹² summarizing President Hall's view: "The wide-spread view that morality can be taught without religion is wrong. . . . Children must have a sense of God as giver of laws, whose demand is right because He wills it; and certainly at adolescence, there must be religion to guide the moral life, if at no other time."

The maintenance of a legalistic stage in the religious development of children may seem at first thought like the imposition of undue rigor and sternness, approaching ascetic discipline. A certain degree of asceticism, however, is defensible, and necessary for the sake of future gain. The universe does not grant immediate satisfaction to all of man's desires, and the habit of accepting with calmness the evil with the good should be established early. An element of

¹² G. E. Partridge, *Genetic Philosophy of Education*, p. 185.

Stoicism is needed in every stable character, and the discipline of early religious beliefs is valuable as a means to the attainment of such a character. James inquires:¹³ "Does not... the worship of material luxury and wealth, which constitutes so large a portion of the 'spirit' of our age, make somewhat for effeminacy and unmanliness? Is not the exclusively sympathetic and facetious way in which most children are brought up today—so different from the education of a hundred years ago, especially in evangelical circles—in danger, in spite of its many advantages, of developing a certain trashiness of fibre? Are there not hereabouts some points of application for a renovated and revised ascetic discipline?"

II

The questions of discipline and of the value of taboo and of beliefs in legalistic religions are questions that merit consideration by themselves. Freudian psychology may be able to contribute something towards a solution of the problem.

There is among educational theorists and others at the present time a somewhat general tendency to rule out discipline, in favor of methods that will allow free self-expression, with trial and error as the first of the ways whereby the child is to learn what is right and wrong. Thus Professor Holt¹⁴ argues against taboos for children. He contends that unless the child is allowed to follow up his impulses to their conclusions, and to learn avoiding reactions in the case of undesirable and dangerous objects through experience with the objects themselves, the proper integration of reflexes will not occur to make later conduct reliable. This is all true within limits: but in many cases the bad consequences of an act are so long deferred that the child will never associate the consequences with the cause; or the consequences may in some cases be immediately disastrous, or perhaps fatal. In such cases the child learns nothing from the experiences, or else learns at too great a cost.

Professor Holt's argument against taboo is inadequate for it is based upon an inadequate conception of taboo. His example of taboo is not an instance of taboo at all. He argues that, in the case of the child who is forbidden by the mother to touch the flame, the child's behavior becomes a function,¹⁵ not of the flame alone, but of the situation—the flame plus

¹³ William James, *The Varieties of Religious Experience*, p. 365.

¹⁴ E. B. Holt, *The Freudian Wish*, Chs. III, IV.

¹⁵ See Professor Holt's definition of behavior, *op. cit.*, Supplement, "Response and Cognition," pp. 153-208.

such activities as are socially acceptable and also in accord with the developing interests of the individual. Harm would result if the primitive desires and activities of children were forbidden, and at the same time no new positive interests were encouraged; but, along with the encouragement of new, socially desirable activities, undesirable tendencies must be discouraged.

On Freudian principles religion is a valuable form of sublimation, especially at the beginning of adolescence, as well as earlier. Freud says,²⁰ "Owing to the oppositional relation existing between culture and the free development of sexuality, the results of which may be traced far into the formation of our life, the problem how the sexual life of the child evolves is . . . of very great importance in the higher stages of culture and civilization." Sublimation is the process by which sexual energy is utilized in other, non-sexual spheres, and in directions that are more approved of by society, and that are ultimately of more value for the individual as well as for society. Art and religion are the chief forms in which sublimated sex energy expresses itself.

According to Freud, the child is "polymorphous-perverse" in his sexual predispositions. That is, in his earliest years he has tendencies towards homo-sexuality, exhibitionism, sadism, masochism, etc. It is through sublimation of these perverse tendencies that normal sexuality and a moral character are developed. The "sexual latency period," from about the fourth year to the beginning of puberty, is the time when repression of perverse tendencies, and sublimation, are necessary. Inhibition of the early tendencies is necessary if neurotic disturbances are to be avoided in later life. Both normal and neurotic adults possess repressions in some degree. In neurotic individuals the repressions are not complete, and they consequently manifest themselves as symptoms of the neuroses, while in normal, healthy individuals repressed wishes are inert, or else they manifest themselves only in dreams. Repression alone, without sublimation, or substitution, will always have bad results; but Freud and most Freudians recognize the necessity of social and religious restraints, inhibitions, and taboos, as a part of the normal sublimation process. Thus Brill says:

"Were it not for the severe checking the individual constantly experiences from the very beginning of his childhood, which causes him to give up most of his desires, it would be impossible to live in any society, savage or enlightened. . . .

²⁰ Sigmund Freud, *Three Contributions to Sexual Theory* (A. A. Brill, translator), p. 85.

"This inhibiting process begins in childhood and is continued throughout life. . . . Throughout the whole course of our existence, society (religion and ethics) teaches us to curb our desires and to give up what we want. We want much and we get comparatively little, but *we never stop wanting.*"²¹

"Civilization, so-called, simply consists of inhibitions imposed upon the individual by religion and society. The more one can inhibit his primitive impulses, the more cultured he is, and savages and children must be taught inhibition to fit them for society."²²

There is no virtue, of course, in curbing desires except for the sake of greater satisfactions; and it is for precisely this result that many of the desires of early childhood should be repressed and sublimated. Later health, not only moral, but also physical, requires sublimation, according to Freud. Whether the activities of the child shall develop into socially acceptable forms, depends upon the success that attends sublimation. Later neuroses result from unsuccessful sublimation and repression.

Freud's psychology has a very distinct recapitulatory background. This is shown especially in his book, *Totem and Taboo*, as is suggested by the sub-title, "Resemblances between the Psychic Lives of Savages and Neurotics." Since the adult neurotic individual represents a continuation of, or reversion to, psychic infantilism in the sexual life, the normal child is on a mental plane corresponding to that of the savage. What is normal for the savage and for the child, is a symptom of disease in the civilized adult.

Freud probable overemphasizes the rôle of the sex instinct in the economy of life, both in healthy and in diseased conditions. Such is the opinion of many critics. But critics such as McDougall,²³ while rejecting Freud's extreme emphasis upon the centrality of sex, are glad to accept his notion of sublimation. Suppression of the primary forms of sex expression, and sublimation of sex energy into more desirable channels under the guidance of religious belief, have definite results of great value, as McDougall points out.²⁴

Much of the early sublimation in later childhood would, in an ideal scheme of things, take place under the influence of religion of the legalistic sort. Then at adolescence sublimation would result, as it actually does in numerous cases,

²¹ A. A. Brill, *Psychoanalysis*, p. 40.

²² *Ibid.*, p. 263.

²³ *Op. cit.*, Supplementary Ch., II, "The Sex Instinct."

²⁴ *Ibid.*, p. 424.

in a development into a new stage of religion, the stage of the redemptive religions. As McDougall says.²⁵ "The intensification of thought and feeling due to sublimation may affect principally the religious interests, and then becomes a main condition of the conversion which is so characteristic of adolescence." So it is seen how religious beliefs corresponding to beliefs of the legalistic stage in racial evolution have positive value at the beginning of adolescence in guiding the moral life and in causing continued sublimation and a normal growth into the redemptive stage of religion. In the words of President Hall: "Adolescence... is a period when, whatever may be the truth about it, it is a wholesome pedagogical method to apply a transcendental, supernatural cult."²⁶ "Religion, which has been the chief agent in regulating it [sex] in the past, must also be looked to in the future."²⁷

During early adolescence religious belief has a pronounced moralizing influence from the fact that the attribution of the new experiences, which are more or less inevitable at this time, to "higher" sources lends a seriousness and even sacredness to the experiences and to life as a whole. On the other hand, the individual who, with truer scientific insight, perhaps, attributes his new experiences of early adolescence wholly to physiological processes, largely of a sexual nature, possessing no religious significance at all, fails to get the inspiration of high moral ideals that are so valuable at this stage of development. It would probably be truer for the adolescent convert to ascribe his experience of conversion to a sexual source, but it is more valuable for him to believe that a religious significance attaches to the experience. One belief tends to elevate the character; the other tends to destroy the practical idealism of the adolescent period. The new emotions may be interpreted grandly or meanly, from "above" or from "below," idealistically or physiologically. For those experiencing the emotions there is value in the idealistic and religious way of interpreting the experiences.

III

I prefer my conclusion to be like that of some of Plato's dialogues—one in which nothing is concluded. I have sought chiefly to call attention to a sometimes neglected factor in education. The question of moral discipline divides American educational theorists into two camps. Professor Dewey

²⁵ *Ibid.*, p. 424.

²⁶ "College Philosophy," *The Forum*, Vol. XXIX (1900), p. 412.

²⁷ *Educational Problems*, Vol. I, p. 460.

represents one tendency, which is, in general, opposed to discipline. President Hall and his followers represent another tendency, which lays emphasis upon moral discipline. The truth probably lies somewhere between these divergent views.

It is claimed by Dewey and his followers that democracy and discipline are contradictory. Discipline is supposed to go only with an autocratic and militaristic form of society. The leading aim of American education, good citizenship in a democracy, if it is to be achieved through the operation of the principle of learning by doing, requires, it is claimed, that children, the citizens of tomorrow, shall learn the democratic principles of self-government by governing themselves today. President Hall accepts the theory of recapitulation as the basis of his view that a certain amount of discipline is necessary in the moral training of children. Such a view maintains equally with Dewey's that democratic citizenship is an important educational aim, perhaps the one most comprehensive aim in American education. It would point out, however, that democracy is the latest stage in racial evolution, a stage which is still in process of becoming established, and that individuals in the immaturity of their childhood and youth ought to relive the earlier life of the race, with its priestly control and its external constraints, before being fitted to take up the duties belonging to the highest stage of racial development.

Recognizing that the theory of recapitulation implies moral discipline, Dewey no longer accepts it,²⁸ though he did so earlier.²⁹ As a matter of fact, an acceptance of the theory, with its implied discipline, does not contradict democratic principles; it simply prescribes a postponement of their application in the nurture of children.

²⁸ *Democracy and Education*, 1916, pp. 84-89.

²⁹ *The School and Society*, 1899, p. 62.

THE BIOLOGICAL VALUE OF RELIGIOUS BELIEF

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Whether God, freedom, and immortality are realities or not, of one thing there is no question: it is a fact, for any observer to take note of, that in many minds there exists the belief in these objects. Religious beliefs are real as psychological entities regardless of the ontological status of the objects of the beliefs. It would be possible to construct a philosophy of religion wholly upon the fact and the value of religious belief, without raising the further question of the existence of the objects believed in, or even if we assumed the unreality of such objects. Beliefs may exist and have value for those who hold them as true even though they are entirely false, since the subjective effects of beliefs are independent of the question of truth; and it is even possible that religion is too good to be true.

Religion would continue in the world indefinitely upon the sheer basis of belief as a psychological fact—a biologically justified fact—even if the whole scientific and philosophical portion of mankind had agreed in branding all religious objects as unreal. James expresses the emotional necessity of religious beliefs for the majority of people when he says,¹ "Materialism and agnosticism, even were they true, could never gain universal and popular acceptance; for they both, alike, give a solution of things which is irrational to the practical third of our nature, and in which we can never feel volitionally at home." Careful observers would have said, before Professor Leuba's recent study² of the actual religious beliefs of American scientists showed that it is so, that the majority of scientists do not believe in God or immortality. This fact is not so significant for the future of religion, however, as the fact that the majority of the parents of each new generation do have religious beliefs. The parents and homes, the churches and general social background, of each new generation, exert a greater influence upon the religious beliefs of people than do a few scientists who have ceased to require religious belief

¹ Wm. James, *The Will to Believe*, p. 126.

² J. H. Leuba, *The Belief in God and Immortality*.

in order to maintain their vital equilibrium. Making the whole world scientific is a hopeless task.

Beliefs exert a potent influence on life. The psychological and physiological effects of belief are shown strikingly in cases of primitive taboo where the *belief* that a taboo has been violated has, in numerous instances, caused death. World-views—beliefs about the ultimate things in man's total environment—are important influences on the physical economy of life. If two nations or races are equal in all respects except that the general philosophy and religion of the one is optimistic, and of the other, pessimistic, the race with the optimistic beliefs will survive in the struggle for existence, while the other race will be driven to the wall. As Goethe says:³ "The real and sole theme of the history of the world is the conflict between belief and unbelief. All epochs in which faith reigns supreme, under whatever form it may be, are bright, uplifting, and fruitful for contemporaries and posterity. All epochs, on the other hand, in which unbelief, in any form, gains a weak victory, even though temporarily boasting a sham glory, will pass away."

Several writers have given clear expression to the biological setting of religious belief. Professor Leuba says:⁴ "The mere belief in gods may of itself produce results sufficient to make of religion a factor of the highest biological importance." "The biological point of view affords the more fruitful outlook. From this point of vantage religion appears as a part of the struggle for life." "Morality and religion . . .," says Professor Carver,⁵ "must be regarded as factors in the struggle for existence as truly as are weapons for offence and defence, teeth and claws, horns and hoofs, fur and feathers, plumage, beards, and antlers." "Who are the chosen people is not a historical question. It is a question of fact, adaptation, and survival. What is the true church will never be determined by archaeological and historical investigation. It will be determined by the laws of selection and survival." Of the actual religious beliefs of the past, Read says,⁶ "Religion, in spite of its many drawbacks, has been so useful that families and tribes have been selected by their addiction to it."

The very fact of the existence of religious beliefs among all primitive peoples establishes a presumption in favor of the biological value of such beliefs. If at any time there have existed

³ Notes to *Westöstlicher Divan*, quoted in Paulsen's *System of Ethics* (Thilly's translation), p. 425.

⁴ J. H. Leuba, *A Psychological Study of Religion*, pp. 14, 16-17.

⁵ T. N. Carver, *Essays in Social Justice*, pp. 20, 31.

⁶ Carveth Read, *Natural and Social Morals*, p. 226.

savage peoples without religious beliefs, they have not survived long in the struggle for life. All the peoples that have survived have possessed, among other things, religious beliefs. From this fact the evolutionist at once infers that religious beliefs must have been of some important service to the race. It might be argued against this by some objectors that the races which have survived have survived by virtue of other kinds of vital fitness, so that religious beliefs have counted neither for nor against survival. It is true that some organs exist the utility of which is not apparent. Since such variations have at least had no disutility, they have not been eliminated through the elimination of the organisms possessing them. But belief is of such practical importance that it can not by any possibility be regarded as neutral, that is, of no influence, favorable or unfavorable, in the struggle for existence. Consequently the universal existence of religious belief among primitive peoples is evidence of its survival value.

Some critics might admit that religious belief has been valuable in the past, during the infancy of the race, while they would argue that, like the vermiform appendix, it has outgrown its usefulness, or has even become a source of injury. G. E. Moore, for example, speaking of religious belief in modern society, says that "there is at least good room to doubt whether it ever does much good."⁷ It can be shown, however, that religious belief still possesses value.

I would repeat that the question of truth is irrelevant to a discussion of the value of religious belief. I am studying the value of beliefs in their psychological context, without regard to the logical matter of truth. Actually, most of the early religious beliefs have had unreal objects, as all would agree, but their value is not thereby vitiated. Thus Read says,⁸ "As for the falsity of a whole religion in its peculiar doctrines, that (I fear we must admit) does not necessarily render it debasing or pernicious; for we have here an extreme case of that astonishing phenomenon in human life, the utility of illusion." And Rashdall says in like manner, "Error and delusion may be valuable elements in evolution;—to a certain extent . . . they have actually been so."⁹ Primitive religions have been the cause of many evils, it is true, but such evils have been more than counterbalanced by numerous positive values.

⁷ "The Value of Religion," *The International Journal of Ethics*, Vol. XII (1901-02), p. 97.

⁸ *Op. cit.*, p. 229.

⁹ Hastings Rashdall, *The Theory of Good and Evil*, Vol. II, pp. 209-10.

I said above that religious belief cannot be regarded as a neutral factor in the struggle for existence. The enormous effect of strong belief is well illustrated by instances of violated taboos among primitive peoples. Frazer cites many striking examples.¹⁰ A Maori slave, upon being told that the food which he had eaten had belonged to a chieftain, and was therefore taboo, "was seized by the most extraordinary convulsions and cramp in the stomach, which neevr ceased till he died about sundown the same day. . . . A Maori woman having eaten of some fruit, and being afterwards told that the fruit had been taken from a tabooed place, exclaimed that the spirit of the chief, whose sanctity had been thus profaned, would kill her. This was in the afternoon, and the next day by twelve o'clock she was dead." There is on record a case of a negro who ate a wild hen, which was taboo, upon the supposition that it was a domesticated fowl. Four years later he was told by his former host what he had eaten, whereupon he "immediately fell a-trembling, and suffered himself to be so far possessed with the effects of imagination, that he died in less than twenty-four hours." Many other instances of a similar sort are cited by Frazer. Such examples of the effects of belief in the case of violated taboos illustrate the general potency of belief. In the majority of cases, of course, taboos are not violated, on account of the beliefs about the consequences of violation, and so the race here receives its first moral instruction.

Though the hygienic value of optimistic religious beliefs in the case of the higher religions is important enough to make of religion a significant factor in the struggle for existence, religious beliefs have been of biological utility to a greater extent through their moral influence. In such forms of the higher religions as Catholicism, both the moral and hygienic values are important. There are certain standards of conduct that are justified by the forces of natural selection, and it seems to be a fact that religious beliefs are the only sufficient instrumentality permanently to maintain these standards. McDougall says¹¹ that the belief in immortality, which is one of the most central of religious beliefs, is essential to the survival of any nation because of its moralizing influence upon thought and conduct.

Some writers have attributed the beginnings and even the continued maintenance of all morality to religious belief.

¹⁰ J. G. Frazer, *The Golden Bough*, 3rd edit., Part II, *Taboo and the Perils of the Soul*. See pp. 135, 137.

¹¹ Wm. McDougall, *Body and Mind*, Preface, pp. xiii, xiv.

Thus Pfeleiderer says,¹² "The historical beginning of all morality is to be found in religion." And Caird says,¹³ "Religion and morality are necessary correlates of each other." Such extreme views are untenable, for certainly in modern society religion is not an essential condition of morality *with all men*, and in primitive society many kinds of right conduct have an instinctive basis, especially in the family relationships. Nevertheless, religious belief has enhanced primitive morality, and continues, on the whole, to possess positive moral value.

Primitive morality is fundamentally a matter of the customs, or *mores*, of the group. Morality is always and everywhere a social phenomenon, arising from the interaction of individuals in groups. A group of Hobbesian individuals is biologically inconceivable. Man, like most of the animal kingdom, possesses various social instincts. Group selection¹⁴ has tended to eliminate all of the too self-centered individuals. Since a group is stronger than an individual in the struggle for existence, only groups have survived; and furthermore, the existence of groups requires the presence of social instincts in the individuals that make up the groups. Altruism is just as instinctive as egoism, and is probably derived from the parental instinct. In many of the lower animals the social instincts manifest themselves in various forms of gregariousness and mutual helpfulness, and much more is this the case with man. Thus primitive man is fitted for moral life within groups by his aboriginal inheritance.

Acts are judged right or wrong by primitive man according as they conform or not to the group customs. So far as primitive customs are instinctive in origin, they have survival value, on the whole, since the instincts are one of the products of the struggle for existence. Religious beliefs enter, however, and complicate the situation. Many of the customs have a religious origin, and others are enforced by religious beliefs, especially by beliefs in taboo. Taboo is the original categorical imperative. It corresponds, in upholding early customs, to the "thou shall not" of the Mosaic code. Taboo is chiefly religious in origin, being based upon the belief in awful and mysterious penalties that will inevitably follow the infringement of certain rules. Since primitive morality consists of primitive customs, taboo is instrumental to primitive morality

¹² Otto Pfeleiderer, *Philosophy of Religion* (Stewart and Menzies, translators), 4 Vols., Vol. IV., p. 230.

¹³ Edward Caird, *The Evolution of Religion*, 2 Vols., Vol. I., p. 237.

¹⁴ See P. Kropotkin, *Mutual Aid, a Factor in Evolution*; Edward Westermarck, *The Origin and Development of the Moral Ideas*, Vol. II, Ch. XXXIV; Wm. James, *Principles of Psychology*, Vol. I, p. 325.

through enforcing the *mores*. There are other means, such as public approval and disapproval and physical force, of enforcing primitive customs, but belief in taboos is one of the very strongest guardians of primitive group morality. Primitive customs have possessed some disvalue, through hindering progress, but they have had positive survival value on the whole; and taboo, in enforcing customs, has possessed value in the struggle for existence. Furthermore, the primitive *mores* have contained the germs of much of our present morality; and taboo has, therefore, been instrumental to the maintenance of conduct that is right, as judged by modern standards.

There have been other values of early religious belief. Religious belief has had what may be called industrial value so far as the industrial arts have developed in connection with the worship of the gods. Religious belief has had scientific and philosophic value so far as pure science and philosophy have developed from religion. The belief in spirits, hero-ancestors, gods, etc., by increasing the extent and complexity of primitive man's environment, has stimulated intellectual activity in dealing with the world. The worship of heavenly bodies has at least attracted serious attention to them, and consequently the science of astronomy owes something to early religious interests. Mythological accounts of the origin and nature of the world have stimulated curiosity about scientific questions, and have given place to more scientific cosmogonies and cosmologies. The various professions have had a religious origin. Priests and chieftains are often identical among primitive peoples. The medical profession has evolved from the work of medicine men. The first teachers were the priests and head-men, who gave instructions to the youth in the initiation ceremonies. There has been a close historical connection between theology and philosophy; and the early religious interest, first becoming intellectualized in the form of theology, has always tended to go over into general philosophy.

Among other values of early religious belief are artistic, social, and legal, or political, values. Primitive religious beliefs have had artistic value so far as poetry, music, sculpture, and architecture have developed out of the service of the gods. Dancing and music were originally of religious significance. The drama traces its origin to religious ceremonials. The first poetry consisted of stories of the gods. The first architecture worthy of the name arose in the construction of altars and temples. In the creation of images of the gods, sculpture appeared. Early painting represented the deeds of the gods and

of ancestral heroes who had been deified. Social value has attached to early religious beliefs so far as the beliefs have been a bond uniting groups in the worship of common deities, supplementing the instinctive basis of group unity. Legal and political values of early religious beliefs appear in the development of property rights and stable forms of government. Taboo has played an important part in the development of rights of property. Holy places are at first the property of the gods. In the case of taboo on chiefs, it is sometimes the case that everything that a chief touches becomes his property. It is of importance for social evolution that the conception of property rights should have arisen early. More obvious is the connection between religion and government or law. The legal profession was originally undifferentiated from the priesthood, and the first laws of the state were religious laws.

Not only the moral value of early religious beliefs, but also the other values, which I have called industrial, scientific, artistic, social, and legal, have been genuine values of a biological sort. They have all possessed evolutionary utility.

The most fundamental distinction between the lower, nature religions, and the higher, redemptive religions may be expressed in terms of the difference between desires for satisfactions of a temporal and physical sort, and desires for transcendent satisfactions. In the nature religions, man is satisfied if he has worldly prosperity; and he believes in and desires transcendent realities only as instruments to the attainment of his worldly desires. It was not until a considerable degree of civilization had been reached that the redemptive religions could appear and maintain themselves. Natural selection, perhaps, accounts for the suppression of interests of a redemptive sort in the periods of prehistoric savagery and of primitive culture, through eliminating any idealistic individuals that may have appeared. A Wordsworthian is not the kind of nature worshipper that would be fit to survive among primeval savages; but, in a social order of more refinement, idealistic beliefs possess a positive biological value for many individuals.

In the higher developments of the religious consciousness, the hygienic value of religious belief, which now becomes instrumental to optimism and hence to health and survival, is perhaps a more important value than the moral value, though the latter is still significant. The complete denial of the existence of the objects of religious beliefs would reduce a large portion of mankind logically to the acceptance of Mr. Russell's statement,¹⁵ "Only on the firm foundation of unyielding des-

¹⁵ Bertrand Russell, *Philosophical Essays*, p. 61.

pair, can the soul's habitation henceforth be safely built." This would be the logic of the situation, but not the "biology" of it. Despair means death, literally. A race that despaired would perish from the earth; but a hopeful faith means life, and gives life abundantly. Faith is biologically necessary for the human race, and it is a psychological fact that "hope springs eternal in the human breast." Mr. Russell's statement is contradicted by the facts of biology and psychology, for on a foundation of despair no habitation at all for the soul can possibly be built.

Such a pessimism as Mr. Russell's is due as much to the pessimist's high ideals as to his beliefs about the objective nature of reality. Pessimism results from the belief in a fundamental misfit between reality and the objects of desire. The man who is content to be a brute, with a brute's desire, is not pessimistic if he finds the world fundamentally brutal. But to the man aware of the "noon-day brightness of human genius," pessimism comes if he believes that "the lofty thoughts that enoble his little day" are insufficiently grounded in the ultimate nature of things.

For large numbers of individuals in modern society, belief in the reality of another world of which the physical world is but a shadow and a promise, is essential to optimism and to a healthy state of mind in general. Professor Hocking's assertion¹⁶ that optimism requires the denial of the reality of the world as it appears to be, together with belief in transcendent realities, is justified by the psychological facts so far as many persons (though not all) are concerned. The "*Weltschmerz* bred of reflection," or "religious pessimism," according to James, "consists in nothing but a religious demand to which there comes no normal religious reply."¹⁷ "Its great reflective source has at all times been a contradiction between the phenomena of nature and the craving of the heart to believe that behind nature there is a spirit whose expression nature is."¹⁸ "No brute can have this sort of melancholy; no man who is irreligious can become its prey. It is the sick shudder of the frustrated religious demand."¹⁹

The inevitable pessimism of naturalism for all persons of sensitive natures who are also reflective, and who take a wide view of reality, has been a frequent theme in prose and in poetry. Some lines in James Thomson's "City of Dreadful Night" express vividly the despair of religious pessimism:

¹⁶ W. E. Hocking, *The Meaning of God in Human Experience*, p. 168.

¹⁷ Wm. James, *op. cit.*, p. 39.

¹⁸ *Ibid.*, p. 40. ¹⁹ *Ibid.*, p. 42.

"The man speaks sooth, alas! the man speaks sooth;
 We have no personal life beyond the grave;
 There is no personal God; Fate knows nor wrath nor ruth:
 Can I find here the comfort which I crave?"

"Speak not of comfort where no comfort is,
 Speak not at all: can words make foul things fair?
 Our life's a cheat, our death a black abyss:
 Hush, and be mute, envisaging despair."

James points out two possible ways of relieving such pessimism. "The longing to read the facts religiously may cease, and leave the bare facts by themselves; or, supplementary facts may be discovered and believed in, which permit the religious reading to go on."²⁰ The first alternative would mean the giving up of religion and the acceptance of a materialistic philosophy. It is true that such a solution is accepted by many persons, but James emphasizes correctly the biological impossibility of the general acceptance of materialistic views by all of mankind.²¹ A spiritual view, on the other hand, releases hope and moral courage; and hope and moral courage are among the things men live by. Such religions as Christianity and Buddhism are essentially religions of deliverance from the vanity of worldly desires. Buddhism is pessimistic so far as the physical world is concerned, but its adherents are made optimistic, and so are enabled to survive in the physical world, through their beliefs in transcendent realities.

Browning's optimism was based upon religious idealism. Reality, as he believed it to be, coincided with what he valued most. Abt Vogler's keys gave their sounds to the wish of the musician's soul. In music this "wish flowed visibly forth." The man with an idealistic temperament will be an optimist only if he believes that this "palace of music," the objectification of lofty aspiration, is "founded flat on the nether springs" of reality. The religious idealist experiences all the emotions of spiritual sovereignty, believing, with the creative musical genius of Browning's poem, that "'tis we musicians know." By him, reality is taken to be such as to satisfy all his deepest longings. For him—

"All we have willed or hoped or dreamed of good shall exist;
 Not its semblance, but itself; no beauty, nor good, nor
 power
 Whose voice has gone forth, but each survives for the melodist
 When eternity affirms the conception of an hour."

²⁰ *Ibid.*, p. 41.

²¹ *Ibid.*, Ch. IV.

Though man's emotional nature in so many cases requires idealistic and religious beliefs, it by no means follows that such beliefs are true. To maintain that the value of idealism implies its truth would be to commit the pragmatic fallacy.²² But there is every reason to think that large numbers will continue to accept religious idealism as true, simply because in so many cases man's emotions determine his beliefs. Those who predict the "irreligion of the future" fail to take into account the emotional and temperamental basis of belief. We may correctly conceive of the conflict between religion and irreligion, idealism and materialism, as a biological struggle between the "tender-minded" and the "tough-minded,"—and the biological advantage lies to some extent with the "tender-minded" so far as their emotional cravings are satisfied by religious beliefs. Religious beliefs not only make for optimism, but are also instrumental in motivating moral endeavor; and consequently, in the highest as well as in the lowest forms of religion, religious beliefs have important biological values.

²² Cf. the author's article, "Two Common Fallacies in the Logic of Religion," *Journal of Philosophy, Psychology, and Scientific Methods*, Vol. XIV., (1917), pp. 653-660.

INTELLECTUALISM VERSUS INTUITIONISM IN FRENCH PHILOSOPHY SINCE THE WAR

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After the war had broken out, and after the first emotions were subdued, and after a sufficient number of facts had been accumulated to justify the resumption of philosophical considerations, decidedly the most striking feature in the writings of those philosophers in France who felt that they could speak for the generations of reconstruction, was an unequivocal *meâ culpa*. There was no pose in it, as if to win applause from the gallery by grandly acknowledging sins in the past and trying to gain absolution on the ground of this easy confession. No, the sincerity, the earnestness of those men is unmistakable. They say not only: "We have allowed ourselves to be misled;" they say emphatically: "It must not happen again!"

But by whom had France been misled? Some pointed to the politicians, whose criminal shortsightedness in leaving the country unprepared had rendered possible the formidable aggression by Germany. Some pointed to the industrial and commercial men of France, who had not kept pace with the rest of the world and who had allowed the so-called "peaceful" invasion of Germany before the war. And some also pointed to the financiers of France, who had been content to be clever bankers, and had made France rich in money only, and not in economic wealth.

But some went deeper than that. After all, when the government had asked to increase war appropriations, it had met with considerable reluctance—Why? The French people themselves had been willing to forsake material comfort and progress to devote themselves to peaceful, intellectual, and artistic pursuits, to discuss Symbolism and Realism, Cubism and Impressionism—Why? Now, they all had to pay dearly—Why?

According to a very representative group of men, the responsibility rested chiefly with the philosophers whose influence had induced the French people to enjoy a merely contemplative life while other nations were engaged in pursuits of material advantages and of conquest. Just as those philoso-

phers and statesmen, who shape public opinion in Germany had screwed up their people to a state of mad Pan-Germanism, so the philosophers and statesmen of France had lulled their people into a state of dangerous security. This involved not only a state of unpreparedness for the war as waged by Germany since 1914, but a perfect waste of good energy in vain and barren sophistications.

That nefarious philosophy, which must be eradicated, assumed different forms; chiefly three.

1. The first is a *sentimental socialism*, based on a naïve, if fine, belief in an international brotherhood—which the war proved to be, if not false in itself, surely far from realization at the present hour (Jaurès).

2. This Utopian socialism, which appealed especially to the masses, assumed in the bourgeois milieu—which claimed to stand on a level a little higher intellectually—the form of what has been called *Moralism*. Moralism is based upon the assumption that there exists a moral conscience, the same in all men, and that one can depend upon this moral sense, and that it cannot be altered in any nation, under any compulsion. What made things worse was that the French philosophers who, by this Moralism, fought materialism as suggested by scientific men, were very prone to point to German philosophers, especially to Kant. As a German was presented in France as the chief representative of that theory, one took for granted that it was actually prevailing in Germany. The fact, was, however, that Pan-Germanists had replaced the creeds of the moral imperative by their Pan-Germanist creed—but were very glad that the French believed that Kantian ethics still prevailed on the other side of the Rhine. Boutroux would be here the most typical name in France.¹

3. The third theory is the worst of all. Unfortunately it has the support of the man who won a tremendous prestige in France and abroad in recent years, Bergson. The theory is Intuitionism, and it is perfectly in line with sentimental Socialism and Moralism; indeed it seems to offer for them a metaphysical background. Intuitionism is anti-intellectualism, or if you prefer, subjectivism; it means a philosophy of personal fancy; in one word, it was just the kind of fluid philosophy, destructive of straight, rational, realistic, virile thought, that Germany could wish for France, a philosophy of unmanly sentimentality: nothing could be more deadly to France

¹ The fact that Boutroux has assailed German ethics since, does not change matters. One may be glad that he came to see at last; but Boutroux has never repudiated his own books yet.

than Intuitionism or Bergsonism. *Bergsonism*, in the eyes of the war generation, that is the enemy!²

* * * * *

The most striking theoretical discussion hostile to Bergsonism is Julien Benda's vigorous *Sentiments de Critique* (1917). Benda opposes with absolute determination and perfect outspokenness the intellectualism of French thought from Descartes down, to that German thought (sincere, or meant simply to sidetrack an enemy nation), which always leaves something to intuition: In its best form, in post-Kantian transcendentalism, German thought attempts to explain more than human intellect can explain; therefore, it is bound to breed confusion and it has to resort to intuition instead of reason in order to get out of this confusion *somewhere*. "Without doubt, reality is obscure, mysterious at bottom, and no definite idea can exhaust the richness of it. But obscure notions, which are most of the time only confused or equivocal,—pseudo-ideas,—fail likewise to exhaust it, and they threaten, besides, to lead us astray." This quotation from Parodi sums up the contention of the whole energetic book. The introducers of Intuitionism in modern thought are the German Romanticists;—and France would have drifted away from its normal course entirely, had it not been for some men like Comte, Taine, and Ribot. Note that all theories which are not amenable to rational thought, are German: Intuitionism—the theory that might is right; Intuitionism—the theory of the superiority of man waging war; Intuitionism again—the theory of the right of one race to rule over others; and Intuitionism—the theory of State opposed to individual. But, of

² It is only fair to say that Bergsonism may be interpreted differently. It was interpreted in a different sense by Péguy, and by young men like Lanux, who emphasized the Pragmatic side of that philosophy. Péguy says: "It is a prejudice, but it is an absolute, ineradicable prejudice, which demands that an inflexible reason should be more a reason than a flexible one. . . . It is evident, on the contrary, that it is the elastic and flexible methods, flexible logic, and flexible morals, which are the most severe, as they adhere the more closely to their object. . . . An inflexible morality may permit crimes to escape from its recesses, while on the contrary, a flexible morality will hold, denounce, and pursue the sinuosities of those things which seek to escape." One may answer, however, "Yes, but if it is so elastic, Bergsonism may as well shelter Bernardism. . . . If Intuitionism requires no rational principles of justice, for instance, why then not as well Might (with the Germans) as Right (with the Allies)? One may venture to say that, had Péguy lived, he would have seen this, and with his characteristic frankness and honesty, written a *Cahier* sharply repudiating his utterances of 1914.

course, Intuitionism—one may say, by definition—works both ways, *all* ways; it works in an imperialistic direction when handled by German statesmen, it works for the pulverization of energies when handled by the subtle mind of a metaphysician of the type of Bergson.³

Benda had a particular right to crush Bergson unmercifully. His is not the case of the man who plays the prophet after the event; for he had before the war, voiced his protest against Bergson fetishism (see his *Bergsonisme ou une Philosophie de la Mobilité*).

Benda goes to the bitter end, for he is not quite sure whether Bergsonism *can* be swept away. "We may still witness," he says, "a detestation of a critical spirit for the benefit of lyricism, as the world has never seen it yet . . . without counting the support that such men will be ready to give who see their reputation involved in it, I mean that army of writers who *font de la vibration* but never have the shadow of an idea. This is not very gay for such as only know how to understand." Remark also the significant words: "It is a serious matter to see the official thinkers of a nation, using their authority since the beginning of the war, to endorse errors which they know to be errors; but with which they know that they please their countrymen. . . . And more serious still, to find that the vogue of those thinkers depends now upon such subservience." And still more direct, "B. and B. (Boutroux and Bergson) take good care not to pass judgment on such ideas. . . ."

So, let us change our ways of thinking, and, before all, as regards the war: "The mastery of war, like that of all that is getting more complex, must rely less and less exclusively on art, and more and more on science. Art is entirely master in some matters, only when those matters are still in the stage of infancy. . . . The reason why one wants genius to be always supreme—so that one may expect everything from it—is first, because it allows us to hope for a speedy solution, . . . a little because it flatters laziness; but especially because of that régime of aestheticism in favor today, which lends religion only to phenomena of the instinct and of spontaneity, and considers as of a rather gross nature the will based on system and organization. . . . Would it be allowable to say that under present circumstances a *renverse-*

³Words must not mislead us. For example, one speaks often of the *mysticism* of Péguy; but that would mean, in the mind of the young Frenchman, only that Péguy defended with a mystic ardor ideas that were based on so strong rational arguments that there could remain no doubt about their truth; it is Descartes' idea that plain, *rational* evidence is the criterion of truth.

ment des valeurs would seem desirable?" Benda means *Renversement of Intuitionism in favor of Intellectualism*.

* * * * *

A book of the same order as Benda's is René Lote's *Les Leçons Intellectuelles de la Guerre* (1917). The author of *Les Origines Mystiques de la Science Allemande* (1913), *Du Christianisme au Germanisme* (which he says was written in 1911, although published in 1914), is only, if possible, more pitiless than Benda against those who, in his opinion, have poisoned French intellectualism with fanciful metaphysicism. The whole volume is an ardent plea for return to clear, sensible thinking, as existed during the seventeenth and eighteenth French century; it is a thorough attack against Romanticism, and beyond it against Rousseau-sentimentalism: the latter's obscure thought makes of the Ego the center of the world and justifies passion.

The book is dedicated to Seillière; it continues the trend of thought inaugurated by Seillière, Lasserre, and Maurras, or even before them by Brunetière, Bourget, and Lemaitre. But, in some way, the note is different from that of the forerunners of twenty or ten years ago. It is not a narrow-minded attack on scientists whose theories were interpreted in terms of materialism in ethics, nor is it made to be a furious attack based on passion rather than on sober argumentation. Lote hits dry, direct, hard. Also he traces the evil much farther back than Benda, farther back than even Edgar Quinet had done; further back than Treitschke, further back even than Fichte. In Lote's opinion one must go back to the eighteenth century: Elizabeth of Russia was merely using flattery towards the Frenchmen of the age of Rationalism, and made them only believe that all Europe was in admiration before the clever geniuses of France; the same is true of Frederick the Great and his so-called protection of Frenchmen of letters exiled from France because of their advanced ideas (Voltaire, Diderot, etc.). Those bourgeois monarchs really got the best of French vanity, and by astutely flattering them rendered them harmless. There are some remarkably suggestive pages; for instance, when Lote points out "the idyllic *bonhomie* of the old Gessner," preparing the sentimental Germany which could be used later to conceal, provisionally, from the outside world the lusty beast of Belgian invasion; or the pages on the "austere criticism" of Lessing, which was meant to ruin the prestige which French classical literature had enjoyed in Germany; or again when Lote points out especially Goethe, who has

been "worked with great skill,"—the "European" Goethe, who was presented to France to prove that in the eyes of Germany there was but one Europe; the "Olympian" Goethe, representing a civilization where one lives above the low and human aims of domination and conquest; or again the "Bourgeois" Goethe, poet of Hermann and Dorothea, who would serve so well to deceive the French with the good-heartedness of Goethe, Goethe plays a symbolic part in the "illusions" of the French people, and has contributed more than any other to make them "heedless (*étourdis*) apostles of mediocre Germany:" Let, therefore, France stop falling on her knees before the "romanesque adventure of the alchemist Faust."

Elsewhere Lote sees, behind the constant study of Romance philology by German scholars, a distinctly unfriendly purpose; namely, they wish to undermine the national feeling, in showing, in French literature and in the various dialects of the country, the trace of entirely different races, which have just *accidentally* been united under one political rule. Here they were Celts, there Wallons, there Provençaux. . . . In dismembering France politically, one would just do the natural thing.

What about philosophy and metaphysics? Nobody was more pleased, of course, than German leaders to see French scholars advocating an impassive and disinterested science on the one hand, and on the other, absorbing themselves in aimless erudition. In the meanwhile, German science simply identified its purposes with those of imperialistic Pan-Germanism. They used their science and their brains to perfect Krupp works while French philosophers outdid Kant and old-time German philosophers in metaphysical acrobatics; while they taught Treitschke and Bernardi to their students, the French besieged the chair of the intuitionistic metaphysician Bergson: Bergson again has to bear the burden of reproach.

There are two imperialisms threatening the world: *Pan-Germanism*, wishing to reign by might of arms, and the gentle, evangelical if you please, imperialism of *Utopian Socialism*, ending in anarchy. Which of the two will win? Let us hope neither, but that the world will belong to science. "Cruel, but necessary science of struggling and of conquering:" for, if things come out this way, there will be again a chance for the spirit that inspired the classic civilization of France, a civilization based on rational and humane principles. As

soon as clear thinking and keenness of intellect are restored, France's days will have returned.

* * * * *

Before ending let us add that the warning against not only the blind admiration for German writers, but against the adoption of the so-called German methods in French universities had started before the war. The stir created in 1911 by Agathon's (Tarde et Massis) *L'Esprit de la Nouvelle Sorbonne* has been often recalled recently; and if the denunciations have become more violent since the war, there have also been some people who thought that tabooing excessive; they could give as an argument the disagreement that existed as to which German authors were particularly objectionable. E. g., many agreed that Nietzsche's following in France has been nefarious, while others declare that Nietzsche has been misunderstood and, moreover, that he was as much a despiser of Germany as any writer since his time. There is quite a literature on that subject. While Claudel, Lotte, and Benda exorcize Nietzsche, Goethe and Kant, not to speak of Luther "who is with the Devil" (Claudel), Henri Bois, in *Kant et l'Allemagne*, frees Kant of the accusation of being a precursor of Pan-Germanism and the "inspirer of the military philosophy invoked by Germans to justify their misdeeds," and Alphonse Aulard, in *La Paix Future d'après la Révolution Française et Kant*, recalls the plan for universal peace laid out by Kant. Lasserre, in a special little book on *Le Germanisme et l'Esprit Humain*, condemns Kant, Schelling, and Fichte, but recommends Goethe, Heine, and Nietzsche. While C. Bonnet, *l'Ame du Soldat* (chap. III), in his meekness, welcomes them all—he is almost Romain-Rollandist.

THE DISCRIMINATION OF CUTANEOUS PATTERNS BELOW THE TWO-POINT LIMEN¹

By CORA L. FRIEDLINE

CONTENTS	PAGE
I. Introduction.....	400
II. Experimental.....	402
1. Apparatus.....	402
2. Subjects.....	402
3. Determination of Pressure Intensity.....	403
4. Pressure Spots.....	403
5. Method: Haphazard Arrangement of Series.....	404
6. The Instructions.....	405
7. General Practice.....	407
8. Experimental Procedure.....	407
9. Results.....	408
10. Discussion of Results.....	409
11. Conditions Which Derange the Experiment.....	410
III. The Alleged Effect of Practice on the Two-Point Limen.....	413
IV. The Alleged Effect of Fatigue on the Two-Point Limen.....	415
Conclusions.....	419

I. INTRODUCTION

It has long been known that stimulation of the skin by a subliminal separation of compass-points is not by any means necessarily perceived as punctiform pressure. Kottenkamp and Ullrich,² for instance, speak of "the impression that the skin is being touched by an elongated body." Camerer³ distinguishes four kinds of perception. Henri and Tawney,⁴ Tawney,⁵ and Judd⁶ have found a variety of impressions

¹ From the Psychological Laboratory of Cornell University.

² R. Kottenkamp and H. Ullrich. Versuche ueber den Raumsinn der Haut der obern Extremität, *Zeit. f. Biol.*, VI, 1870, 42.

³ W. Camerer. Versuche ueber den Raumsinn der Haut nach der Methode der richtigen und falschen Fälle, *Zeit. f. Biol.*, XIX, 1883, 282.

⁴ V. Henri and G. Tawney. Ueber die Trugwahrnehmung zweier Punkte bei der Berührung eines Punktes der Haut, *Philos. Studien*, XI, 1895, 394 ff.

⁵ G. Tawney. The Perception of Two Points not the Space-threshold, *Psych. Rev.*, II, 1895, 585 ff.

⁶ C. H. Judd. Ueber Wahrnehmungen im Gebiete des Tastsinnes, *Philos. Studien*, XII, 1896, 409 ff.

-ranging from one point to a line between boundaries. Leuba⁷ noticed that "the passage from oneness to twoness is through a sensation of length." Bolton⁸ mentions intermediate forms which lie between one and two points. Binet⁹ obtained a special perceptive form within the limits of one and two points. Foucault¹⁰ distinguishes no less than six intermediate perceptive forms. Gates,¹¹ working in the Cornell laboratory in 1915 by a strict psychophysical procedure, was able to assign quantitative values to such patterns as circle, line and dumb-bell, which lay between the extremes of one and two points.

The whole question of these cutaneous patterns was set in a new light when Titchener¹² in 1916 showed that, if no effort is made to rule out the stimulus-error, discrimination may be carried to a very high degree of delicacy. Titchener used his results to explain the discrepancy found by McDougall¹³ in the cutaneous perceptivity of Englishmen and Torres Straits Islanders. An extension of this work by de Laski¹⁴ seemed to show that further systematic investigation might make it possible to reconcile, in like manner, some of the outstanding controversies concerning the aesthesiometric experiment.

The present paper is a report of such an investigation. We have sought to determine the limits of discrimination of two-point impressions, when the subjects¹⁵ are left entirely free to objectify them, to take them as cutaneous 'things' or 'objects,' in other words, to take up towards them the attitude of everyday life rather than that of descriptive psychology. We shall first state what our subjects have been able to do, and shall then try to show that shifts from the everyday to the psychological attitude will account for differences of

⁷ J. H. Leuba. On the Validity of the Griesbach Method of Determining Fatigue, *Psych. Rev.*, VI, 1899, 576.

⁸ T. L. Bolton. Ueber die Beziehungen zwischen Ermüdung, Raumsinn der Haut und Muskelleistung, *Psychol. Arbeiten*, IV, 1902, 192.

⁹ A. Binet. La mesure de la sensibilité, *L'année psych.*, IX, 1903, 79 ff. Cf. J. F. Messenger, *Harvard Psych. Studies*, I, 1903, 130.

¹⁰ M. Foucault. L'illusion paradoxale et le seuil de Weber, 1910, 124 ff.

¹¹ E. J. Gates. The Determinations of the Limens of Single and Dual Impression by the Method of Constant Stimuli, *Amer. Journ. Psych.*, XXVI, 1915, 152 ff.

¹² E. B. Titchener, in *Proc. Amer. Philos. Soc.*, LV, 1916, 569 ff.

¹³ See *Reports of the Cambridge Anthropological Expedition to Torres Straits*, II, 1901, v. f., 1 ff.

¹⁴ E. de Laski. On Perceptive Forms below the Level of the Two-point Limen, *Amer. Journ. Psych.*, XXVII, 1916, 569 ff.

¹⁵ We use the term *subjects* rather than *observers*, since we made no demand for psychological observation and descriptive reports.

numerical results that have hitherto been ascribed vaguely to practice and fatigue.

II. EXPERIMENTAL

1. *Apparatus.* The apparatus consisted of a modification of the improved Jastrow aesthesiometer. We modified this instrument¹⁶ by supporting it from the handle by means of a compression spring. This spring was placed about the stem of the aesthesiometer as an axis, between a stop at the upper end of the stem and the top of the handle, to which it was attached. The aesthesiometer can thus be lifted by the handle, with its weight compressing the spring. If the points are now brought into apposition with the skin and the handle is lowered from the stem, the weight of the instrument, as the spring extends, will gradually be transferred from the handle to the skin. The rate of depression of the handle, after the points have come upon the skin, determines the rate of application of the pressure; and the amount of depression, the amount of the pressure. (Since the instrument can be weighted and various springs used, any desired pressure can be obtained.) We found it convenient to encase the spring in an aluminum tube, which was attached to the handle and fitted over the stop at the upper end of the stem. This tube kept the spring in place, steadied the handle (since it fitted accurately over the stop), and would be more convenient to grasp, in manipulating the aesthesiometer, than the handle itself. In our case, however, a constant application of stimulus was obtained by means of the mechanical device described by Dimmick.¹⁷ The amount of pressure employed was 15 grams \pm .5 mg. (25 trials, measured on a chemical balance). The arm of the subject was placed in a plaster cast, and the apparatus was supported over the arm in such fashion that it could be moved in both directions in the horizontal plane. A silent pendulum was used for controlling the warning signals and the length of the stimulations.

2. *The Subjects.* The subjects were Mr. L. B. Hoisington (H), instructor in education, practised; Mr. F. L. Dimmick (D), assistant in psychology, highly practised in cutaneous observation; Miss J. M. Gleason (G), graduate fellow in psychology, well practised; Mr. P. T. Young (Y), graduate scholar in psychology; and Mr. G. J. Rich (R), graduate student in psychology. The last-named took part only in the preliminary work.

¹⁶ The aesthesiometer will be described in detail later.

¹⁷ F. L. Dimmick. On Cutaneous After-Images, *Amer. Journ. Psych.*, XXVII, 1916, 566.

3. *Determination of Pressure Intensity.* We have said that the pressure employed was that of 15 gr. This intensity of stimulus was chosen after we had made, in preliminary experiments, a comparison of the pattern-names obtained for the same stimuli at different intensities. The method of procedure was as follows.

The stimulus-differences 15 mm. and two-points-apposed were used. Each of these stimuli was given 9 times with a pressure of 10 gr. After every application the subject was asked to describe the pattern, and then to give a general characterization of the impression at the end of the ninth application. The same method was followed with pressures of 20 and 15 gr., respectively. Results showed that approximately the same patterns were obtained for the corresponding stimuli at the different pressure-intensities.

For instance, in 35 trials with 15 mm. separation, G reports dumb-bell (12)¹⁸, two points (13), double paddle (10), with the intensity 10 gr.; dumb-bell (8), two points (12), and double paddle (15), with 20 gr.; dumb-bell (17), two points (13), double paddle (5), with 15 gr. D reports, for the same separation, two points (10), dumb-bell (12), long line (13), for pressure of 10 gr.; two points (15), dumb-bell (20), with 20 gr.; and two points (23), dumb-bell (12), with 15 gr. Similarly, R obtains line (22), dumb-bell (13), with pressure of 10 gr.; line (28), dumb-bell (7), with 20 gr.; and line (21), dumb-bell (14), with 15 gr. With two-points-apposed, in 35 trials, G reports line (12), short straight line (5), small dumb-bell (18), for 10 gr. pressure; line (22), short line (13), with 20 gr.; line (25), short line (10), with 15 gr. D obtains one point, and R spot, in all 35 trials for every intensity of pressure, with two-points-apposed.

The middle pressure of 15 grams was selected as that to be employed throughout the investigation.

4. *Pressure Spots.* Another preliminary problem was that of determining whether it was necessary to avoid the stimulation of highly responsive pressure spots in applying the points. In other words, our aim was to find out whether the patterns obtained with the stimulation of highly responsive pressure spots differed from those which occurred when less responsive pressure spots or intermediate cutaneous areas were stimulated. The most responsive pressure spots within the area of stimulation were accordingly localized (in 15 trials), and marked by means of indelible ink. The stimulus employed for localization was a horse-hair of 0.105 mm. in diameter. This was fitted into an aesthesiometer tube, and adjusted to present a length of 38 mm., its stimulation value being 2.4 g/mm. (von Frey's tension units). The separations used in the work were 15 mm. and two-points-apposed.

First, 9 applications of the stimulus corresponding to the separation 15 mm. were given. Care was taken to stimulate a different intensive pressure spot every time. (Obviously, only one pressure spot could be stimulated in a given application, since the distance apart of the pressure spots did not necessarily correspond to the separation distance 15 mm.). The subjects were told to notice how the stimuli were alike, with a view to reporting a common pattern-name at the end of the ninth application. In a similar manner, 9 applications corresponding to the stimulus two-points-apposed were given, with the request for a report of a common pattern-name at the end of the ninth application. The above method of procedure was also used for the determination of pattern-names where the intensive pressure spots were

¹⁸ Numbers in brackets indicate the number of times the pattern is reported.

avoided in the application of the points. The results showed that the stimulation of intensive pressure spots made no significant difference in the patterns obtained for the two separations.

In 50 trials (450 applications) with 15 mm. separation, G reports, with highly responsive pressure spots: double paddle (19), dumb-bell (31); without highly responsive pressure spots, double paddle (10), dumb-bell (26), two points (14). Similarly D reports: with highly responsive pressure spots, long line (41), two points (9); without highly responsive pressure spots, line (43), two points (7). In 30 trials, R reports: line (18), dumb-bell (12), with highly responsive pressure spots; and line (23), dumb-bell (7), without highly responsive pressure spots.

For two-points-apposed, with pressure spots, in 50 trials G reports: line (27), short, straight line (12), short dumb-bell (11); and line (28), short straight line (22), without responsive pressure spots. Similarly, D obtains one point for all 50 trials, both with and without the stimulation of highly responsive pressure spots. In 30 trials, R reports, with highly responsive pressure spots, spot (10), circle (20); and spot (30), with avoidance of such pressure spots.

We further tried to find out whether the stimulation of the highly responsive pressure spots as compared with the stimulation of the less responsive areas made a difference in the percentage of accuracy in the haphazard series. The method was much the same as that described above. The subject was given 9 practice applications of the separation 15 mm. and was asked to characterize the impression at the end of the ninth application, and also to memorize it with a view to identifying it later in a haphazard series. In a similar manner, he was given the stimulus of two-points-apposed. This was followed by a haphazard series of 10 applications, composed of 5 applications of each stimulus employed in the practice series. The subject was asked to judge which one he was receiving, as immediately as possible after it was applied. The procedure was followed, first, with the stimulation of the most responsive pressure spots, and secondly, with avoidance of these spots.

Although the investigation was not extensive, the results were definite enough to warrant the conclusion that the stimulation of the highly responsive pressure spots as compared with that of other areas made no significant difference in the percentage of accuracy obtained in the haphazard series.

In 4 haphazard series, with the stimulation of highly responsive pressure spots, G obtained an average of 80% accuracy, and on other areas also 80%, for stimulation with the separation 15 mm. For two-points-apposed, the same subject obtained 90% both with the stimulation of the highly responsive pressure spots and with that of other areas.

In 3 haphazard series, D obtained 100% with highly responsive pressure spots, and 93% with the less responsive areas, for the 15 mm. stimulation. For two-points-apposed D obtained 87% in both cases.

5. Method: Haphazard Arrangement of Series.

Eleven separations below the two-point limen were used:¹⁹ app., 2, 5, 7, 10, 12, 15, 17, 20, 22, and 25 mm. They were

¹⁹ The limens for D and G were accurately determined as 30 ± 0.8 and 32 ± 2.0 mm. respectively. Those for F and Y were less accurately determined as 29 and 33 mm.

arranged in pairs in all the mathematical combinations possible, and these pairs were drawn at haphazard during the course of the investigation, thus determining the order of the 55 experiments as follows:

1. app-15	15. 5-12	29. 5-15	43. 7-15
2. 10-20	16. 7-22	30. app-10	44. 15-17
3. 5-25	17. 17-22	31. 15-22	45. 12-20
4. 7-12	18. app- 2	32. 10-25	46. app- 5
5. app-17	19. 2- 7	33. 7-10	47. app-12
6. 10-17	20. app-22	34. 2-22	48. 5-22
7. 5-20	21. 7-17	35. 5-10	49. 17-20
8. 20-22	22. 2-17	36. 10-22	50. 2-15
9. 2-12	23. 12-25	37. 15-25	51. 2-25
10. 2- 5	24. 20-25	38. 5-17	52. 7-25
11. 15-20	25. 5- 7	39. 22-25	53. 17-25
12. 12-22	26. app-25	40. 12-17	54. 2-20
13. 7-20	27. 12-15	41. app-20	55. 2-10
14. app- 7	28. 10-12	42. 10-15	

Every experiment consisted of 10 haphazard series, each one made up of 10 applications, 5 of the stimulus corresponding to the first, and 5 of the stimulus corresponding to the second separation of the pair employed. There were, therefore, 100 applications in a single experiment. The order of application of the stimuli, within every series of 10, was determined separately for that series by the drawing of lots. The investigation as a whole, then, consisted of 100 observations upon every one of the 55 possible pairs of separations, or of 5500 observations for a single subject.

6. *The instructions.* Our first instruction was as follows:

"You will be given in a practice-series two cutaneous stimuli which I shall name 'A' and 'B' respectively. After four presentations of each, given in the order, A, B; B, A; A, B; B, A; with their names, I shall give you a series in which the stimuli A and B occur in haphazard order.

"You are to judge each impression as A or B, or you may report, 'I can't tell.' You may, however, use any other names which seem more appropriate or convenient to distinguish the two impressions.

"Make your judgment as quickly as possible. The stimulus will not be removed from your arm until you have made your judgment.

"Any observations or remarks that you care to make may be dictated to the experimenter at the end of the series."

This instruction, however, proved unsatisfactory. It became evident that if a stimulus A were paired in a given haphazard series with a certain B, A might always be recognized: whereas, if the same A were paired with a certain other B, it might never be recognized. This result seemed to indicate that

judgments were made in terms of A and not-A, or B and not-B, rather than in terms of A and B.²⁰

Accordingly the instructions were changed to the following:

"In a practice-series I shall apply to your arm two cutaneous stimuli which I shall call 'A' and 'B.' I shall apply each stimulus twice, giving its name each time. You are to identify and to memorize the two impressions.

"I shall then give you a series in which the stimuli A and B occur in haphazard order. You are to judge the impressions as A or B, or you may say 'I can't tell.' You may, however, use any other name (*e. g.*, a descriptive term) that helps you to identify the impressions. Make your judgment as quickly as possible.

"Any observations or remarks that you care to make may be dictated to the experimenter at the end of the series."

The subjects still had difficulty in identifying the two impressions. In addition, they complained that the length of the practice-series was too short to permit them to memorize the patterns. The instruction was, therefore, altered to read as follows:

"You will be given nine²¹ cutaneous stimuli that are just alike. Notice how these are alike all the way through with a view of reporting a common pattern-name at the end of the ninth. Be sure to look for likenesses. I shall ask for a report of pattern at the end of the ninth."

This instruction preceded the giving of the practice series. In the early part of the investigation the subject was instructed as follows before every haphazard series:

"You will now be given a haphazard series composed of the two stimuli which you have just received. I shall ask you to judge which one you are receiving each time. You may use any terms you like to designate the two stimuli."

As the subjects became practised, the instruction preceding the practice-series was shortened to "Nine of each," "Three of each," or was not given at all, while that employed with the haphazards became unnecessary and was consequently omitted.²²

²⁰ Our attention was called to this error by the fact that an impression which was apparently identified in one series might fail altogether of identification in another series. For instance, in the case of app-5, 5 mm. apparently was always recognized, whereas in the case of 5-10, this same 5 mm. was never recognized. Another indication was the fact that, in the haphazard series proper, there were as many different patterns for the 5 mm. stimulus as there were applications of that stimulus.

²¹ This number was found convenient for covering the cutaneous area, since it permitted a uniform variation of the position of the points.

²² The observation periods were one hour in length. At first, only 3 haphazards were given during the hour, but as the subjects became

The results which are the subject of discussion of this paper were obtained entirely under the final instruction.

7. *General Practice.* A certain amount of preliminary practice work was necessary in order to accustom the subjects to the conditions of the experiment. Among the initial difficulties we have already mentioned that of interpreting the instructions. During this period the judgments in the haphazards ranged from 50 to 80% in accuracy, whereas in the later series with maximal practice the judgments, as will be seen, ranged from 80 to 100%. G required 16 haphazard series, extending over a period of 5 hours, for practice. D required 10 haphazards, extending over a period of 3 hours; Y, 39 haphazards, covering a period of 13 hours; while H was able to make accurate judgments almost from the beginning.

8. *Experimental procedure.* The observation periods of one hour each occurred three times a week. The experiments were performed as often as possible in the early morning hours when the subject was free from fatigue.

The work was done on the volar distal right fore-arm in an approximately longitudinal direction. An area 40 mm. long by 10 mm. wide was marked off with ink in a place relatively free from veins and tendons. Topographical features of the skin ensured constancy in the marking of this area. The position of the points was varied as much as possible within the area in order to avoid fatigue of the skin.

We have said that a plaster cast was made for the arm of every subject. This kept the arm in the same position, and rendered it immovable throughout the course of the experiment. At first, the arm was taken out to rest during the interval between the practice and the haphazard series, as well as between the separate haphazard series. These rests were later omitted, however, as the subjects became practised.

The subject was comfortably seated at a table with his arm in the cast, which was excluded from his view by means of a cardboard screen. The experimenter gave the usual Ready-Now signals and applied the stimulus corresponding to the first member of the practice series. The stimulus was kept on the arm for a period of two seconds, the interval elapsing be-

practised, this number was gradually increased, until in particular instances it was possible to run off as many as 40 haphazards during the course of a single hour. In the early part of the work, 18 practice applications were given before every haphazard series of 10, i. e., 9 of each stimulus of the pair. Later the practice series were lessened to 6, i. e., 3 of each stimulus composing the pair. Finally, in the case where 40 haphazards were reached, it was necessary to give the practice series only once, namely, at the beginning of the experimental hour. This was possible only where the subjects obtained 100% accuracy, since the presence of an incorrect judgment in the haphazard series always necessitated the giving of a practice series before the next haphazard.

tween the separate stimulations being one and one-half seconds. This interval was later decreased to one second. At the end of the ninth application, the general pattern name was recorded. Similarly, a second practice series of nine was given. These were followed by a haphazard series. The length of application of the stimuli here was the same as that in the practice series.

The judgments in the haphazard series were usually made in terms of the pattern names given in the preliminary series. As a rule, they were made as immediately as possible after the application of the stimulus. Upon the completion of 10 haphazards, a new experiment was announced.

9. *Results.* Table I gives a summary of the results of the entire experiment. The numbers represent the percentages of correct judgments in the case of each member of a pair of stimuli. They are based on the averages of 10 haphazard series, *i. e.*, 100 judgments (50 on each stimulus), obtained at maximal practice.

The lower values in this table might very well have been raised to 100-100, with more results taken. The lower num-

TABLE I

Number of Experiment	Separations in mm.	D	G	Y	H
18	app- 2 ²¹	— ²⁴	86- 92	—	—
46	app- 5	100-100	92- 92	94- 94	94- 86
14	app- 7	100-100	94- 90	96- 88	86- 86
30	app-10	100-100	96- 98	90- 92	98- 92
47	app-12	100-100	96- 94	86- 92	92- 86
1	app-15	100-100	100-100	94- 92	96- 94
5	app-17	96-100	98-100	94- 96	98- 96
41	app-20	100-100	100-100	86- 98	98- 94
20	app-22	100-100	100-100	84- 96	100- 92
26	app-25	100-100	100-100	86- 96	100- 92
10	2- 5	—	86- 94	—	—
19	2- 7	100-100	86- 90	88- 94	92- 96
55	2-10	100-100	100-100	92- 98	94- 90
9	2-12	100-100	92- 98	94- 94	94- 98
50	2-15	100-100	100-100	84- 88	98- 94
22	2-17	100-100	100-100	88- 92	88- 84
54	2-20	100-100	100-100	88- 96	98- 94
34	2-22	100-100	100-100	90- 92	98- 92
51	2-25	100-100	100-100	90- 98	100- 94

²¹ Typical of the patterns reported are line, short line, dumbbell, double paddle, single paddle, oval, circle, oblong, rectangle and bar.

²⁴ The failure of an experiment is indicated by a dash.

TABLE I (Continued)

Number of Experiment	Separation in mm.	D	G	Y	H
25	5-7	—	—	—	—
35	5-10	100-100	96-94	98-96	86-86
15	5-12	100-100	100-100	96-94	90-86
29	5-15	100-100	94-92	80-94	90-94
38	5-17	100-100	98-94	94-98	88-94
7	5-20	98-100	100-100	86-92	94-88
48	5-22	100-100	100-100	84-98	100-88
3	5-25	100-100	100-100	98-96	96-90
33	7-10	96-100	92-94	—	—
4	7-12	100-100	100-100	90-98	88-88
43	7-15	98-100	100-96	84-96	88-94
21	7-17	100-100	96-94	82-92	96-96
13	7-20	100-100	100-100	86-88	96-88
16	7-22	100-100	100-100	84-94	98-94
52	7-25	100-100	100-100	82-94	98-100
28	10-12	—	—	—	—
42	10-15	100-100	96-94	92-94	90-94
6	10-17	96-94	92-94	96-98	86-90
2	10-20	100-100	100-100	96-88	98-86
36	10-22	100-100	98-96	98-100	94-90
32	10-25	100-100	98-100	96-98	92-96
27	12-15	—	—	—	—
40	12-17	100-100	94-90	92-98	96-96
45	12-20	100-100	100-100	88-96	96-96
12	12-22	100-100	98-100	90-96	92-94
23	12-25	100-100	100-100	94-96	96-84
44	15-17	—	—	—	—
11	15-20	100-100	94-98	94-92	98-92
31	15-22	100-100	94-98	98-96	96-92
37	15-25	100-100	98-98	96-96	88-90
49	17-20	—	94-98	—	—
17	17-22	100-100	94-98	94-98	94-90
53	17-25	100-100	100-100	90-98	92-88
8	20-22	—	—	—	—
24	20-25	100-100	90-92	94-98	94-96
39	22-25	—	94-100	94-98	—

bers mean, in the majority of cases at any rate, some temporary disability.

10. *Discussion of results.* From a study of the table it is evident that the subjects either were able to distinguish be-

tween the separations with a considerable degree of accuracy, or were not able to make any distinction at all between the separations given them. The latter result is found, however, only in the case of separations which were very near together.

Table II gives the experiments which were declared by the subjects to be especially difficult. Where the experiment failed, that result is indicated by a dash. Difficulty is indicated by "X." Absence of mark means that the experiment was not difficult for that particular subject.

In the case of D and G, the distinction is clear-cut, while in the case of Y and H there is variation. If some subjective difficulty arises, it is, of course, possible for any pair to be regarded as difficult, no matter how wide the separation of the points.

In the case of the more difficult experiments we found that it was possible to take only two haphazard series at a time; after these, the subject was likely to break down completely.

TABLE II
TABLE OF DIFFICULTIES

Number of Experiment	Separations in mm.	D	G	Y	H
18 46 14	app- 2 app- 5 app- 7	— X	X X X	— X	— X
10 55	2- 5 2-10	—	X X	—	— X
25 35 15	5- 7 5-10 5-12	— X	— X	— X X	— X X
33 4	7-10 7-12	X X	X	— X	— X
28 42 6	10-12 10-15 10-17	— — X	— — X	— — X X	— — X X
27	12-15	—	—	—	—
44	15-17	—	—	—	—
49	17-20	—	X	—	—
8 24 39	20-22 20-25 22-25	— X —	— X X	— X X	— X —

11. *Conditions which Derange the Experiment.* Throughout the course of the investigation certain factors were noticed which proved fatal to the securing of any results. When

these influences were operative, it became impossible for the subject, despite his best efforts, to identify the patterns presented to him in the haphazard series. This means that there was no series of graded judgments in the haphazard series, when these conditions occurred, since the percentage of accuracy dropped straightway from 100-80 to 20-0 and 40-0, leaving not even the possibility of a chance distribution of judgments. In other words, the haphazard series could not even be termed a 'bad' one, but was rather a complete failure. Furthermore, in the presence of these factors, the subjects were frequently unable to give a general characterization of the impression at the end of the ninth application of the practice series, so varied were the separate impressions. Under these conditions stimuli as widely separated as 25 mm. and 5 mm. were reported as giving the same pattern. Subjects also mention variations in the sensitivity of the area, and in the intensity, size, clearness and brightness of the impressions themselves.

A discussion of these factors and their influence upon the results follows.

Fatigue. D was particularly liable to fatigue. For instance,²⁵ at 5 p. m. 11/13/17, app-17, D's results were 40-20 (Av. 2), but at 10 a. m. 11/16/17, his results are 96-100 (Av. 6), for the same stimulus pair. Similarly at 5 p. m. 10/17/17, app-15, his results are 40-0 (Av. 2), but at 8 a. m. 10/20/17, they are 100-100 (Av. 5).

H was also affected by fatigue caused by staying up all night. At 10 a. m. 1/27/18, app-15, results are 20-0 (Av. 3), but on 1/30/18, at the same hour, they were 80-84 (Av. 5). In connection with the first series he remarks: "I can't feel the thing at all; the patterns are just the same—points." H also reports that, when he is fatigued, waves of numbness sweep over the arm from the finger tips to the elbow, preventing the obtaining of results, except for one or two series at the beginning of the hour.

Fatigue in G is also accompanied by numbness in the arm, which prevents the obtaining of patterns. For example, at 8 a. m. 1/4/18, 12-25, G obtains such results as 20-40 (Av. 3) in the haphazard series, but at 8 a. m. 1/8/18, she obtains 100-100 (Av. 5) for the same stimuli. G, however, was seldom troubled by fatigue.

Y experienced a general state of fatigue during a period of several days, which prevented the securing of any results, no matter what stimuli were employed. This period extended from 12/7/17 to 1/28/18, during which time Y was unable to give any results when the following stimuli were employed: 15-20, 12-22, 7-20, app-7, 5-12, 7-22, and app-25. Y remarks: "The period in which I did nothing was a period of general fatigue. I am just coming out of this state of

²⁵ A convenient formula will be used for the expression of the results given here: 1. Time of day; 2. Date; 3. Stimuli employed; 4. Results of haphazards in average percent; 5. Number of haphazards from which the average is obtained. (Ex: with stimuli app-15, 20-0 means 20% accuracy for apposed and 0% for 15.)

fatigue." [This was reported at 10 a. m. 2/1/18, when his results with app-22 are 80-100 (Av. 2)].

At 10 a. m. 2/2/18, in connection with the same experiment, Y obtains such results as 20-0 (Av. 2) and reports fatigue from being up late the night before. He remarks: "Yesterday the impressions were as clear as ice, now they tend to confusion. There is a change in the experiences themselves as they are given. There is a tendency for the points to turn and be at an angle to the axis of the arm. This is especially true of the smaller patterns. There is also a tendency for three points to come in. I have noticed that this usually means that I am no good at all. The impressions themselves are of low intensity and weak; the distance between the points varies, in the larger pattern. Sometimes the points are bright, other times they are dull, round, and more spread out. There is also a tendency for them to roll off my arm."

At 9 a. m. 2/27/18, with 2-17, results are 40-20 (Av. 4), and Y remarks: "The patterns become smaller and smaller when I fatigue out on them."

General Physical Condition. Both H and Y are unable to work when affected by cold or grippe. H at 10 a. m. 12/29/17, 10-17, obtains 20-0 (Av. 4). He remarks: "My arm is insensitive, there are waves of numbness." But on 1/8/17, at the same hour, he has no difficulty in getting 80-100 (Av. 3).

At 10 a. m. 1/9/18, H reports indigestion, and this throws off the results on 10-17 again, to 0-40 (Av. 3).

Y reports a cold, and consequently obtains no results in the following experiment. At 12 a. m. 11/23/17, app-17, he gives 20-20 (Av. 3), whereas results on 11/23/17, were 80-100 (Av. 3).

After-Images. A source of error inherent in the procedure itself was the arousal of cutaneous after-images. G was particularly subject to these images. They were especially troublesome where the separations were close together, and made it impossible to run more than one or two such haphazards in the course of an hour. Their occurrence also made it impossible to take more than three experiments in a single hour, as a rapid succession of stimulations was always accompanied by numerous after-images. When after-images appeared, the experimenter wiped the area gently with a soft cloth. This corrective was usually successful.

Towards the end of an experimental hour H frequently complains that all sorts of other impressions creep in, in nature like after-images. For instance, at 4 p. m. 2/14/18, 2-25, results are 0-20 (Av. 3) towards the end of the hour, but on the following day at the beginning of the hour the same stimuli give results 100-100 (Av. 5).

Emotional State. The emotional state of the subject frequently prevented the obtaining of any results.

D at 10 a. m. 11/20/17, app-17, 40-20 (Av. 4), says: "I hate the experiment—I am mad at the thing. I do not know what I am looking for. The thing is nerve-racking; you expect me to do well and yet you put everything in the way you can." But at the same hour on 11/21/17, with the same stimulus pair and no inhibiting emotional state, he obtains 100-100 (Av. 4). Again at 10 a. m. 12/13/17, 15-20, 40-0 (Av. 3), he says: "The emotional side makes a lot of difference. Every little thing you do bothers me—the making of the report, the putting down of the pencil, etc."

The giving of a difficult series at the beginning of the hour usually

annoyed D to such an extent, and upset him so much emotionally, that no results could be obtained during the remainder of the hour. For instance, the giving of 15-17, on 1/27/18 at 10 a. m., threw off the results in 12-20 to 40-0 (Av. 4).

Y frequently reports a variable mood, which is accompanied by variations in the experiences, as to distance apart, number, size and brightness. At 12 a. m. 12/5/17, 5-20, Y obtains 20-0 (Av. 3), when in a variable mood. Again, at 10 a. m. 1/30/18, 2-20, Y's results are 0-40 (Av. 4), and he reports: "I do not feel in the mood, I am nervous. I do not want to quiet down to this." But on the following day with the same experiment, at the same hour, his results are 100-100 (Av. 3), when he is in an even frame of mind.

Suggestion. The element of suggestion entered in with especial force when the memory of a difficult series carried over from one experimental hour to the next. At 10 a. m. 1/17/18, 22-25, in the case of D, gives no results. On the following day, D remarks that the first experiment is going to be difficult. Moreover, the slightest suggestion on the part of the experimenter was sufficient to influence the results. For example, at 8 a. m. 11/17/17, 10-17, G asks if the patterns which she is about to receive are difficult. The experimenter incautiously replied that the experiment might possibly be difficult, but that it had not yet been tried. This resulted in 0-40 (Av. 2). But on 11/19/17, at the same hour, the experiment gave 100-100 (Av. 3), with no difficulty at all.

Temperature of the Cast. It was necessary to keep the casts at a moderate temperature since extreme temperatures prevented the securing of results. For instance, G was unable to identify the patterns in the haphazard series when the cast was very warm. At 8 a. m. 12/27/17, 25-20, results were 33-33 (Av. 3), but under normal conditions on 12/28/17, results were 100-100 (Av. 2). Extreme cold had a similar effect. At 8 a. m. 1/7/18, 12-25, results were 20-0 (Av. 4), but are 100-100 (Av. 10), at the same time on the next day when the cast is at normal temperature.

At 2 p. m. 1/4/17, Y gets no pattern-differences for app-25, and consequently the haphazard is not given, but on the following day at 10 a. m. he obtains 86-96 (Av. 10), when the cast is at the usual temperature.

Noises. D was distracted by outside noises such as talking in an adjoining room, or the ringing of the chimes. At 5 p. m. 11/13/17, 7-12 the results are 40-40 (Av. 2), when D is disturbed by the ringing of the chimes, but are 100-100 (Av. 10) later, when the chimes have ceased to ring. Again, the results at 10 a. m. 10/23/17, for 10-20 are 60-50 (Av. 2) when there is conversation in the next room, but change to 80-100 (Av. 1) when the conversation has stopped.²⁶

III. THE ALLEGED EFFECT OF PRACTICE ON THE TWO-POINT LIMEN

In the literature we find conflicting statements as to the influence of practice on the two-point limen. Some investigators

²⁶ Foucault (*op. cit.*, 180) finds that pain in the head and poor sleep render the perceptions uncertain. Noikow (see Note 41 below; 437 ff.) notices the disturbing effects of poor sleep, no breakfast, headache, cold, fever, being out late and being up all night.

assert that the limen can be greatly reduced by practice, and others hold that there is no such reduction.

The first experimental investigations in regard to the influence of practice on the limen were made by Volkmann and Fechner²⁷ in 1858. These investigators found a decided decrease in the limen with practice. For instance, the results of Volkmann show a reduction in the limen on the volar side of the left hand from 8 to 2 Paris lines (1 Paris line = 2.27 mm.), while the limen on the dorsal fore-arm decreased from 14.2 to 4.8. Similarly, the limen for Fechner's hand showed a decrease from 10.4 to 4.4, while that of the fore-arm changed from 14.9 to 7.5.

Dresslar,²⁸ in 1894, found that there is a decided increase in discriminative ability with practice. The value of the limen on the volar side of the left fore-arm, in a particular instance, decreased from 33 mm. to 2 mm. during the course of the morning, and from 26 mm. to 1 mm. in the afternoon.

Tawney²⁹ finds a decrease in the threshold value with practice in the case of some observers. In one case the threshold, on the left fore-arm, decreased from 50 mm. to 5 mm. during the course of 20 days. Again, in the case of another observer, the threshold on the dorsal side of the right arm, above the elbow, showed a decrease from 55 mm. to 4 mm. But here there were frequently two thresholds present on the same day. For example, on a certain day the thresholds were 5 and 28, on the next day 7 and 30, then 8 and 30. Furthermore, when it was suggested to the observer that the influence of practice would be investigated, the value of the threshold decreased all the way from 14 mm. to 2 mm., while on the preceding day the values averaged 38 ± 4 (Av. 11).

In 1897, Solomons³⁰ found that the knowledge of the observer as to whether he was right or wrong had an influence upon the results. In the beginning of the experiment, both of his observers distinguished two points on the fore-arm at a distance of approximately one and one-half inches. However, after a few weeks' practice, the observer who had been informed as to the nature of his results distinguished two points at a distance of one-fourth inch, while the other observer still maintained the distance he had at the beginning of the experiment.

Foucault,³¹ on the other hand, maintains that there is not any change in the threshold due to practice. His observer's threshold values are 12.75 mm., 11.25 mm., 12.18 mm., and 12 mm.

In order to explain the disagreement of these authors, we must take into consideration the fact that, with training, we attain a high degree of accuracy in the discrimination of 'objects' presented to us by the skin. Our own experiments

²⁷A. W. Volkmann, Ueber den Einfluss der Uebung auf das Erkennen räumlicher Distanzen, *Ber. d. Sächs. Ges. d. Wiss.*, X, 1858, 38ff.

²⁸F. B. Dresslar, Studies in the Psychology of Touch, *Amer. Journ. of Psychol.*, VI, 1894, 313 ff.

²⁹G. A. Tawney, Ueber die Wahrnehmung zweier Punkte mittelst des Tastsinnes, mit Rücksicht auf die Frage der Uebung, *Philos. Stud.*, XIII, 1897, 163 ff.

³⁰L. Solomons, Discrimination in Cutaneous Sensations, *Psych. Rev.*, IV, 1897, 246 ff.

³¹*Op. cit.*, 168 f.

show that, with training, distances as close together as 3 mm. can be discriminated without difficulty. This ability to distinguish between cutaneous objects may be used to account for the results of those authors who assert that there is a decrease in the limen with practice. For instance, the reduction of a limen from 40 mm. to 2 mm., in a particular case, may simply mean that the subject has changed his attitude in regard to the object which he was judging as the experiment progressed. In other words, the subject has been judging different objects, instead of the same object. He has, accordingly, reduced the size of the limen by changing his attitude in regard to the object judged. This reduction in the limen, due to a change of the object, has been wrongly called practice.

On the other hand, the results of those authors who affirm that there is no practice may be explained by the fact that the subjects have kept a constant attitude in regard to the object judged. Consequently, the limen has remained the same. Our own results indicate that there is no true practice-reduction except that which manifests itself in the initial stage. Practice, then, simply amounts to becoming acquainted with a particular object, so that we are able definitely to recognize it when it is presented; it means that we are getting the object, stably, at its lower limit. The 'reduction of the limen' depends upon other conditions.

IV. THE ALLEGED EFFECT OF FATIGUE ON THE TWO-POINT LIMEN

The results of previous investigators show a similar disagreement as regard the influence of fatigue upon the limen. There are those who declare that the aesthesiometer is a reliable measure of fatigue, as opposed to those who do not find such a condition.

Griesbach³² was the first to observe that the limen is increased by fatigue. His subjects were pupils in the *Gymnasium* and in the *Ober-realschule*. Measurements were made at the end of every hour of school work during the course of the day. He finds an increase in the threshold on the forehead from 4 mm. to 11 mm., and on the red of the under lip from 7 mm. to 19 mm. in the case of a 13-year-old pupil. Again, the threshold on the cheek increases from 11 mm. to 23 mm., and on the ball of the thumb from 6 mm. to 13.5 mm., in the case of a 16-year-old subject. Similarly, there is an increase in the threshold from 13 to 34 mm. on the cheek (front), during an examination day, for a pupil in the *Realschule*.

³² H. Griesbach, Ueber Beziehungen zwischen geistiger Ermüdung und Empfindungsvermögen der Haut, *Arch. f. Hygiene*, XXIV, 1895, 124 ff.

Griesbach's³³ later measurements, made on members of the recruiting commission at Müllhausen, also show that fatigue causes an increase in the limen. In the case of the physician whose duty it was to examine the candidates the limen on the forehead measured 6.7 mm. at 8 o'clock in the morning, but after four hours' work increased to 15.5 mm. Similarly, the limen on the ball of the thumb (right) increased from 6.5 mm. to 8 mm.

The results of Wagner³⁴ and Vannod³⁵ agree with those of Griesbach. Wagner's results show an increase in the limen on the cheekbone from 11 mm. to 24 mm., from 5 mm. to 12 mm. and again from 3 mm. to 14 mm.

Vannod observes an increase in the limen on the forehead from 3 mm. to 12 mm., and from 4 to 16 mm. on the cheek, for a 16-year-old pupil in the *Realschule*.

Blazek,³⁶ in his experiments on the pupils in the *Franz-Joseph-Gymnasium*, found that the curves in several cases showed an increase in the limen with fatigue. Schuyten³⁷ also finds that the aesthesiometric method is satisfactory for measuring the fatigue of school children. Binet³⁸ concludes that it is possible to measure the intellectual fatigue of the school child by means of the aesthesiometer.

Sakaki,³⁹ who experimented in the schools of Japan, found an increase in the value of the limen with fatigue. His curves, which are based upon averages, show an increase in the limen during the course of the school day.

Bonoff,⁴⁰ a school physician, worked upon the pupils of the *Gymnasium* and found that the aesthesiometer can be used to measure fatigue. He found an increase in the limen on the cheek from 5.2 mm. to 11.38 mm. (average results for pupils during the course of examinations which lasted seven days). The limen on the cheek of 21 candidates for the baccalaureate examination increased from 7.7 mm. at 7:30 a. m. to 12.7 mm. at 1 p. m.

Noikow's⁴¹ results indicate that the aesthesiometer is an index for the measure of fatigue. His measurements were made on the fore-

³³ H. Griesbach, Weitere Untersuchungen ueber Beziehungen zwischen geistiger Ermüdung und Hautsensibilität, *Internat'l Mag. of School Hygiene*, I, 1905, 414.

³⁴ L. Wagner, Unterricht und Ermüdungsmessungen an Schülern des neuen Gymnasiums in Darmstadt, *Samml. v. Abhandl. aus d. Gebiete d. päd. Psychol. u. Physiol.*, I, 1898, Hft., IV, 1 ff.

³⁵ T. Vannod, La fatigue intellectuelle et son influence sur la sensibilité cutanée, *Dissert. med. de Bern*, 1896, 1 ff.

³⁶ B. Blazek, Ermüdungsmessungen mit dem Federaesthesiometer an Schülern des Franz-Joseph-Gymnasiums in Lemberg, *Zeit. f. päd. Psychol. u. exp. Päd.*, I, 1899, 311 ff.

³⁷ M. C. Schuyten, Comment doit-on mesurer la fatigue des écoliers, *Archiv. de Psychol.*, IV, 1904, 113 ff.

³⁸ A. Binet, Recherches sur la fatigue intellectuelle scolaire et la mesure qui peut en être faite au moyen de l'esthésiomètre, *L'Année psychologique*, XI, 1905, 1 ff.

³⁹ Y. Sakaki, Ermüdungsmessungen in vier japanischen Schulen, *Internat'l Mag. of School Hygiene*, I, 1905, 86 f.

⁴⁰ N. Bonoff, Étude médico-pédagogique sur l'esthésiometrie et la simulation à l'école, *International Mag. of School Hygiene*, IV, 1907-8, 387 f.

⁴¹ P. M. Noikow, Aesthesiometrische Ermüdungsmessungen, *Internat'l Mag. of School Hygiene*, IV, 1907-8, 437 ff.

head before and after fifteen minutes' work in arithmetic. In the case of one subject, the threshold increased from 5.3 mm. to 11.8 mm. For another subject, there was an increase from .2 mm. to 10.5 mm. Again, in the case of a girl in the elementary school, he finds an increase in the threshold from 1.9 mm. to 7 mm. after a lesson in reading. However, he finds that there is a lessening in the value of the threshold after very strenuous work. For example, in the case of one subject, the threshold on the forehead decreased from 8.5 mm. to 1 mm. after a written examination, while that of another decreased from 12.4 mm. to 2.5 mm. after a two hours' examination. He attributes this decrease in the threshold-value to hyperaesthesia.

Offner⁴² states that the relationship between fatigue and the spatial limen is sufficient to justify the use of the aesthesiometer as a measure of fatigue, more correctly as a measure for one of the symptoms of fatigue.

Foucalt,⁴³ in his experiments upon two children, noticed that an excessive prolongation of the experiment resulted in an appreciable increase in the threshold. The first case is that of an eight-year-old girl, upon whom he made 12 successive determinations on the second phalanx of the dorsal side of the index-finger, with short intervals for resting. The threshold-values were as follows: 8 mm., an irregular series, then 8, 10, 8, 10, 8, 10, 12, 12, 12, 12. On the evening of the same day he obtained: 8, 12, 14, 14. The second case is that of a blind child, eleven years of age. The results were as follows: 12, 10, 10, 12, then 16, then an irregular series. He concludes that it is not surprising that the Griesbach method succeeds, in the light of the above results, provided, of course, that one is not too exacting on the quality of the measurement.

On the other hand, the validity of the Griesbach method for the determination of fatigue has been severely criticised and questioned.

Leuba,⁴⁴ who experimented upon adults and college students, concludes that the aesthesiometric method is not to be regarded as a definite measure of fatigue, since many other factors must be taken into consideration, which are not capable of being measured. Germann,⁴⁵ whose results are based upon the tests of a single subject, was unable to find any relation between fatigue and the limen. Ritter,⁴⁶ in his experiments upon the students in the *Gymnasium*, did not find that the aesthesiometer could be used to measure fatigue. Bolton⁴⁷ concludes that the size of the threshold is not a measure of the effects of fatigue or mental work. His tables show that severe mental work, lasting for two hours, did not affect the threshold sufficiently to be detected by the aesthesiometer. Kraepelin⁴⁸ states that within very wide limits a

⁴² M. Offner, *Mental Fatigue*, Eng. trans. Baltimore, 1911, 36 f.

⁴³ Op. cit., 181 ff.

⁴⁴ J. H. Leuba, On the Validity of the Griesbach Method of Determining Fatigue, *Psych. Rev.* VI, 1899, 573 ff.

⁴⁵ G. B. Germann, On the Invalidity of the Aesthesiometric Method as a Measure of Mental Fatigue, *Psych. Rev.*, VI, 599 ff.

⁴⁶ C. Ritter, Ermüdungsmessungen, *Zeits. f. Psychol.*, XXIV, 1900, 401 ff.

⁴⁷ T. L. Bolton, Ueber die Beziehungen zwischen Ermüdung, Raumsinn der Haut und Muskelleistung, *Psychol. Arbeiten*, IV, 1902, 175 ff.

⁴⁸ E. Kraepelin, Ueber Ermüdungsmessungen, *Arch. f. d. ges. Psychol.*, I, 1903, 9 ff.

definite relationship between size of threshold and degree of fatigue cannot be established.

Meumann⁴⁹ admits that the threshold is heightened by fatigue, but states that the increase is only very indirect and is complicated by many other factors, about which little is known. Whether the threshold increases in proportion to fatigue and permits of the use of the value which is found, as a real measure of fatigue, is a question which we cannot answer.

Martyn⁵⁰ concludes that changes in the spatial threshold are not sufficiently constant to be regarded as sure signs of fatigue in its early stages. Her results, however, do show just the kind of increase in the threshold which we should expect. For instance, the average of 10 thresholds taken before one hour's adding every day for 10 days was 7.65 mm., as compared with the threshold of 9 mm. which was taken after the adding, in the case of one subject. Again, the threshold for a second subject was 6.09 mm. before adding, but 6.87 mm. after adding, while that of a third subject increased from 7.30 mm. to 7.83 mm. These increases in the limen, according to our notion, were probably due to fatigue. The measurements cited above were made upon the left zygomatic arch.

It is clear from our own experiments that the initial determination of the two-point limen may mean very different things. If the experimenter happened to start with the two points clearly differentiated, fatigue will have a relatively small effect; but if the point of departure is some cutaneous pattern subliminal to two points, which nevertheless in a fresh condition can be distinguished from the pressure of a single point, then fatigue will, as our experiments show, make the identification of this pattern impossible and thus tend to raise the recorded limen.

It is evident, then, that if the limen which is initially determined is not the real two-point limen, it is impossible to keep a constant attitude when fatigue is present. For instance, the increase in the limen from 13 to 34 mm. on the cheek (Griesbach) may simply mean that the subject had for his initial limen some subliminal cutaneous pattern which, in a fresh condition, could be distinguished from the pressure of one point. With fatigue, the identification of this pattern became impossible. Consequently the subject was judging different 'objects' at the two stages of the test.

On the other hand, the results of those authors who assert that the limen does not increase with fatigue may be explained by the fact that the limen which was first determined was the real two-point limen, and not some subliminal cutaneous pattern which would be distinguished from the pressure of

⁴⁹ E. Meumann, *Vorlesungen zur Einführung in die experimentelle Pädagogik und ihre psychologischen Grundlagen*, II, 1907, 90 ff.

⁵⁰ G. W. Martyn, A Study of Mental Fatigue, *British Journ. of Psychol.*, V, 1913, 427 ff.

one point when the subject was in a fresh condition. Consequently, the limen remained approximately the same when the subject became fatigued. Our own results indicate that a constant attitude is possible only in cases where a real two-point limen has been determined in the beginning of the experiment.

CONCLUSIONS

(1) Our results show an extreme delicacy of discrimination below the level of the two-point limen. It is possible, for instance, to distinguish distances as near together as app-2, and 2-5.

(2) The subjects either were able accurately to distinguish between the cutaneous patterns or failed completely.

(3) The subjects were frequently unable to distinguish between the separations presented to them because of the fact that certain conditions such as physical disability, suggestion, temperature of the cast, etc., were operative. When these conditions were present it was impossible for the subjects to distinguish between the very widest separations.

(4) Very considerable changes in the limen, which have been ascribed to fatigue, are probably due to the fact that the object of judgment was not kept constant throughout the course of the investigation. The limen initially determined was in all probability not the limen of clear separation, but only some subliminal cutaneous pattern.

(5) We have been able to account for the divergent views held heretofore as to the effect of practice on the two-point limen. We have shown that the practice-effect of certain investigators is really not due to practice at all, but rather to a shift of attitude on the part of the subjects, involving their occupation at different periods of the investigation with different cutaneous objects.

THE LOCALISATION OF FEELING¹

By P. T. YOUNG

CONTENTS

	PAGE
Introductory.....	420
I. Quantitative Results.....	422
Percentage of Localised Feelings.....	422
Distribution of Localised Feelings.....	422
Relation of Localised Feelings to Mixed Feelings.....	422
Conclusions.....	424
II. Analytical.....	424
Qualitative Differences of Feeling.....	424
Types of Localisation.....	426
Characterisation of Object-feeling.....	427
III. Discussion.....	428
Dependence of Qualitative Differences of Feeling upon Sensory Components.....	428
Dependence of Localisation of Feeling upon Sensory Components.....	429
Conclusions.....	430

Störriug,² in 1905, basing his conclusion upon the reports of 3 subjects and also upon objective records, distinguished between *Empfindungslust* and *Stimmungslust*. His method was the following: "während man bei der Erzeugung von Lust, die an eine Geschmacksempfindung geknüpft ist, die Geschmackslösung während der Dauer des Versuchs im Munde behalten lässt, gab ich zum Zweck der Erzeugung von Stimmungslust der Vp. die Anweisung, die Lösung zu schlucken und dann von der Empfindung abzusehen, mit dem Schlucken den Geschmacksreiz als eine erledigte Tatsache zu betrachten." After a little practice, the subjects were able to carry out the instruction, and agree "dass an der unter den neuen Bedingungen entstandenen Lust die gesamten jeweilig vorhandenen Bewusstseinsinhalte teilhaben, während die unter den gewöhnlichen Bedingungen entstandene Lust an die Geschmacksempfindungen allein gebunden erscheint, die Geschmacksempfindungen zusammen mit der Lust sich als geson-

¹ From the Psychological Laboratory of Cornell University.

² Störriug, G., Experimentelle Beiträge zur Lehre vom Gefühl, *Arch. f. d. ges. Psychol.*, 6, 1905, 316-32.

dert von den übrigen Bewusstseinsinhalten darstellen" Rose³ in 1913, accepting Störing's distinction, defines "Stimmungslust als solche Lust, die das Gesamtbewusstsein okkupiert, und Empfindungslust als solche Lust, die eng gebunden ist an einen Empfindungskomplex." *Empfindungslust* is localisable: "Die Unlust ist ganz im Munde lokalisiert" (Vp. Btz.); "Vp. N. gibt an, dass sich die Unlust direkt und ausschliesslich an die Zunge knüpft." *Stimmungslust* is not localisable.

With *Empfindungslust* mixed feeling (coexistence of pleasantness and unpleasantness) is possible whether or not pleasantness (P) and unpleasantness (U) are antagonistic, for P and U may exist side by side as red and green in the same visual field. With *Stimmungslust*, however, mixed feeling is a question of the antagonism of P and U.

The experimenters recording mixed feeling also note that P and U may be localised. Nakashima⁴ remarks that "a few cases of affective localisation occurred in the experiments by the method of single stimuli." Koch⁵ states: "in unseren Versuchen finden wir, sobald die Versuchspersonen nur einige Übung in der Selbstbeobachtung erlangt haben, zahlreiche Fälle von Zuständen der Lust und Unlust, die deutlich lokalisiert werden." Wohlgemuth⁶ notes that "*the feeling-tone is mostly localisable*. With tactile, pain, olfactory and gustatory sensations this is almost invariably the case with subjects R and F. Subjects P and J are unable to localise the feeling-tone at the beginning of the investigation, but as the training proceeds statements to that effect, become more frequent." Finally in our own investigation⁷ of mixed feeling, localisation occurred in the reports of several subjects.

The following study of affective localisation is based upon the results of a previous study of mixed feeling, to which the reader is referred for method, divisions of the experiment, stimuli, and other details.

³ Rose, H., Der Einfluss der Unlustgefühle auf den motorischen Effekt der Willenshandlungen, *Arch. f. d. ges. Psychol.*, 28, 1913, 109-10.

⁴ Nakashima, T., Contributions to the Study of the Affective Processes, *Am. Jour. of Psychol.*, 20, 1909, 184.

⁵ Koch, B., Experimentelle Untersuchungen über die Mannigfaltigkeit der elementaren Gefühlsqualitäten, *Halle Diss.*, 1911, 90.

⁶ Wohlgemuth, A., On the Feelings and their Neural Correlate, with an Examination of the Nature of Pain, *Brit. Jour. of Psychol.*, 8, 1917, 450.

⁷ Young, P. T., An Experimental Study of Mixed Feelings, *Am. Jour. of Psychol.*, 29, 1918, 237 ff.

I. QUANTITATIVE RESULTS

Percentage of Localised Feelings. Table I shows the number and percentage of reports containing localised feeling. Three reports (F, 2; G, 1) are ambiguous, and 1 (G) is doubtful. If we eliminate these equivocal reports, there remain 72, or 3.2%, localised feelings, reported by three subjects (H, F, K). Six of 9 subjects report no unequivocal localised feelings.

TABLE I
PERCENTAGE OF LOCALISED FEELINGS

Subject	B	Da	Di	F	G	H	K	O	W	Total
Number reports.....	193	275	242	252	232	242	307	278	191	2,212
Reports containing loc. feeling.....	0	0	0	19	2	51	4	0	0	76
Percentage.....	0	0	0	7.5	.8	21.0	1.3	0	0	3.4

Distribution of Localised Feelings. Table II shows the number of localised feelings reported on successive days of the experiment.⁸ It will be seen that localised feelings occur in sporadic groups. Note the large group of H, days 4-9, and F, days 10-14. Note also the groups, extending for two consecutive days, of G, days 2-3, and K days 23-24. Apart from these well-defined groups, localised feelings are reported at random on single days.

Relation of Localised Feelings to Mixed Feelings.

The relation of localised feeling to mixed feeling is shown quantitatively by several facts. In the first place, the same subjects report both: unequivocal mixed feeling is reported⁹ by F (4), H (4), K (21), O (2); unequivocal localised feeling is reported by F (17), H (51), K (4). In the second place, the distribution of localised feelings and mixed feelings is of the same type: both occur in sporadic groups throughout the course of the experiment and throughout the single experimental hour. In the third place, the groups of localised feelings and mixed feelings overlap; both occur on the same days. Table IV shows the coincidences.

In the fourth place, the percentages of mixed feelings and localised feelings are almost identical, although the overlapping is only partial. There are 3.2% mixed feelings¹⁰ and 3.4% localised feelings in the experiment as a whole.

⁸ For the total number of reports on these days see *ibid.*, 246.

⁹ *Ibid.*, 244.

¹⁰ *Ibid.*, 244.

TABLE II
DISTRIBUTION OF LOCALISED FEELINGS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
F	0	0	0	0	2	0	0	0	0	2	7	3	2	3	0	0	0	0	0					
G	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
H	0	3	0	1	4	2	21	16	1	0	0	0	0	0	0	0	3	0	0					
K	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1

Within the single experimental hour localised feelings tend to occur in groups of consecutive reports. Table III illustrates this tendency.

TABLE III
DISTRIBUTION OF LOCALISED FEELINGS WITHIN THE SINGLE EXPERIMENTAL HOUR

Subject	Day	Number reports	Reports containing localised feeling
F	10	16	152, 153
	11	14	165, 166, 167-172, 173-175, 176
	14	10	205, 206, 207
H	7	25	76, 77, 78, 79-81-83, 84, 85, 86, 87, 88, 89, 90, 91-94, 95, 96, 97, 98, 99, 100
	8	26	101, 102-104, 105-107-110, 111-113-115-117-119, 120, 121-123, 124-126

TABLE IV
COINCIDENCES OF MIXED FEELINGS AND LOCALISED FEELINGS

Subject	F		H			K	
Day	11	13	2	5	6	23	24
Number of localised feelings.....	7	2	3	4	2	2	1
Number of mixed feelings.....	3	1	3	4	1	5	2

Of the 71 mixed feelings reported, 9 contain explicit localisation¹¹ of the coexisting feelings (H, 4; K, 3; F, 1; G, 1). Nineteen others seem to imply a localisation by the statement that the object-feeling is "attended to," is in the focus or background of consciousness, etc. The remaining 43 contain no statement regarding localisation. However, all of the "mixed feelings" are of an objective type of report, characterised by reference of P-U to an object and identification of P-U with an object; so possibly in some cases localisation is taken for granted and not reported. The feelings may be localised in the following mixed-feeling reports, for example, although there is no specific mention of *place where* as regards P and U.

"You have the U from one field and the P from the other" (H 16). "Slightly P from the body and a more intense U from the sandpaper; seemingly two disparate things" (H 18). "It seemed that the sweetness of the odor and its piquancy were there at the same time—P and U" (O 135). "It is difficult to say whether just the odor was there or whether a P odor was there" (O 140). "The bitter and the sweet were there side by side and I think the feelings were there" (W 50).

We conclude (1) that the subjects show marked individual differences in the tendency to report localised feelings, (2) that localised feelings are reported sporadically in groups throughout the course of the experiment and throughout the course of the single experimental hour, and (3) that there is a very close quantitative relation between mixed feelings and localised feelings.

II. ANALYTICAL

Qualitative Differences of Feeling. Some of the subjects, especially G, report qualitative differentiation of Ps and Us.¹² Following are examples:

¹¹ *Ibid.*, 260. Seven of these reports are printed in full.

¹² By a mere chance the qualitative differences recorded are between Ps; there are very few qualitative differentiations of Us in our protocols.

"The tactual sensations were P in quality and exciting. I had a different quality of P . . . a comfortable feeling" (G 41). "The first was a much livelier P than the other; it seemed closely connected with the bodily attitude of attending and it hung over while the other P that I would call comfort came in" (G 121). "At first an agreeable P and then a lively P with an amusing aspect" (G 150). "At first a very lively P with strong organics of even intensity. . . . Then the P started again; this time much quieter than before. It was made up partly of enjoyment and partly of relief" (G 154). "The first P was satisfying. Then the quality of the P changed with the coming of the second experience; I got quite strong exciting P with amusement. Then I seemed to get a shift between the quiet sort of P and the exciting. Sometimes the quiet P was in the focus and the other in the background, and then the tables were turned and the other P came to the focus with the quiet, comfortable P in the background" (G 157). "A feeling of well-being. Then another P which had a different quality; it was a soothed feeling. Then some of the first P came again and the other dropped out." (F 197). "A big shift in feeling. A strong suggestion of two qualitatively different Ps, but I'm not sure" (B 143). "Both experiences were P: one was a tickling P and the other was a soothing P. You seem to get the body divided; all down the central core and on my left side I could feel the smooth, swaying rhythm of the movement. Whereas, at the right of the head and shoulder there was this P tickling feeling like quick vibrations running all over you" (H 73).

Subject F reports qualitative differences of a different order between object-feelings. "Feeling" is equivalent to "what the object suggests," "what it is like," "how it makes one feel," "what it makes one want to do," etc. "Feeling," again, is sometimes described in sensory terms. There is thus a double confusion (1) between meaning and feeling, and (2) between sensation and feeling. In the following examples compare the stimulus with the "feeling" it evokes:

(Water on face) "U, a cold feeling, a feeling of being disturbed" (F 76). (Bite of banana) "P, a soft, velvety, cold feeling; it was much as if someone had put something into your hand that was soft and velvety and cold" (F 89). (Asafoetida) "U, an irritated feeling. You feel as you feel when you are peeling an onion" (F 90). (Fife) "That's the feeling that makes your teeth go together. It makes you shrink and sends shivers up and down your back. It makes you feel gritty all over; you feel like jumping up and stopping it" (F 92). (Hot brass on cheek) "That's U. It makes cold chills go up your back. It feels burny, hot and inflamed" (F 94). (Quinine) "U, a drawn-up feeling as if you were being squeezed; a withered feeling. You feel as if the corners of your mouth were drawn down" (F 97). (Peppermint candy) "Very P. It makes you feel soothed, soft and velvety. It makes you feel very happy, elated, expansive, as if you had won a victory" (F 98). (c, e, g, c'.) "The same feeling as listening to a harp" (F 99). (Rattle) "That's U, a chaotic feeling" (F 103). (Odor coffee) "This is P. I felt as if I were taking coffee; a smoky feeling in the throat" (F 122). (Odor turpentine) "This is P. I feel as I feel when I walk through a newly-painted house. A spicy, refreshing feeling" (F 123). (Sight of dead rabbit) "A sym-

pathetic U. It makes you feel the way you feel when you see a dead cat" (F 126). (Nitrobenzole odor) "This is P, a spicy, peppery feeling" (F 133). (Pressure cotton) "A soft, soothing feeling" (F 140). (Sarsaparilla, stale cheese). "At first a sweet, sickish feeling and then a disgusting organic feeling" (F 155).

Types of Localisation. There are four types of localisation, which are described below.

1. P and U may be localised at the place of the stimulus-object. Following are examples:

(Taste of salt solution) "U, a drawn-up feeling . . . localised in the mouth" (F 152). (Odors: cinnamon *plus* asafoetida) "It is as if one were in each nostril. On the left I got P and on the right I got U" (F 166). (Chord c, e, g, c') "P seemed in the center of my head" (F 175). (Pinch nose with clothes pin) "U localised in my nose. An explosive feeling as if you were stopped up and going to explode" (F 176). (Shrill fife) "The U was localised inside my head between the ears" (F 178). (Rap on forehead) "A pain U was localised in the head" (F 185). (Sharp nail on cheek) "A U localised on the cheek" (F 197). (Taste solution alum) "A drawn-up feeling localised in the mouth" (F 205). (Sandpaper teeth) "Then U localised in my teeth, an annoying feeling" (F 207). (Shrill fife) "U. The experience seemed to be in the head; the feeling was localised in the head; the U was in the ears" (H 78). (Asafoetida) "U, purely in the nose and throat" (H 81). (Bite of banana) "The P was part in the stomach and part in the mouth" (H 83). (Sandpaper forehead) "Mostly felt—in the sense of affection—at the point of contact. Some feeling seemed to come from between the shoulders" (H 87). (Peppermint candy) "P; a mild feeling pretty much limited to the mouth" (H 98). (Odor vanilla) "Mild P, confined pretty much to the head and throat" (H 107). (Burn hot brass) "Purely a pain U, localised distinctly at the point of contact" (H 115). (Sandpaper arm, perfume) "U on my hand and P with my nose" (K 12). (Velvet on one cheek, sharp nail on other) "The feelings were localised in the cheeks" (K 312).

2. P and U may be localised organically, remote from the stimulus-object. Following are examples:

(Perfume, H₂S) "P localised along the spinal cord" (H 23). (Torture, perfume) "The perfume was very, very P and it was as if you felt it in the center of your body right up through the viscera. The U seemed to be confined more to the outside muscles—the skeletal muscles" (H 58). (Torture, perfume) "The P was a weak central core in the middle of me. The P did not extend below the thorax. The U was all over the body, even to the feet, only it didn't get inside of me" (H 60). (Imaginary stink, perfume) "I had a kinaesthetic experience then as if I were being rulled apart; it was U. It was well down in the abdomen whereas the P was felt in the upper part of the chest" (H 67). (Metronome, largo 42) "An irritating U; the feeling was in the legs and arms" (H 79). (Anise odor) "P, very mild and soothing, in the middle part of the body. The periphery of the body does not seem to be involved but rather the central part" (H 96). (Odor stale cheese) "Quite strongly U. The feeling experience seemed to localise above the stomach" (H 113). (Peppermint candy)

"P, mild but soothing. It was confined to the column in the center of the body" (H 126). (Picture mural decoration) "The pleased aspect was localised peripherally" (H 235).

3. P and U may spread out or radiate from a given center so that they pervade the body. P and U may also move up and down the trunk or across the body. Following are examples of irradiating and moving feelings:

"One of those Ps that I feel through the entire trunk of the body. It begins at the bottom of the body and works up" (H 7). "A slightly nauseating U particularly in the stomach. It spread itself out to most of the body" (H 84). "It is all up and down the main part of the body. It doesn't affect the arms much but it does extend to the legs" (H 85). "A mild, soothing P from the lower abdomen up—not including the arms, however. It was stronger towards the top of the body and seemed to fade away at the lower part" (H 88). "A moderately strong feeling of U. It was felt more particularly through the chest. Most of those feelings go up and down but that feeling ran through from right to left" (H 89). "A sickening, nauseating U. It was localised more particularly in the stomach but was felt all over the body, somewhat in the lower limbs" (H 91). "P confined to the head. A tendency for the feelings to go down the body" (H 101). "The U experience is localised more particularly at the base of the spine. A jerky thing that runs out through you seems to be the U" (H 104). "P localised in the chest, in the upper part of the trunk. It had a radiating attribute" (H 105). "The U seems to center pretty low in the body near the base of the spine" (H 117). "The feeling experience is quite bodily with its focus at the ear" (H 119). "Moderately U; up and down the spine" (H 121). "At first the U was merely in the mouth but quickly it passed to the body. The feeling seemed to pervade the body" (H 123). "U; it became more generally diffuse throughout the body" (H 128).

4. P and U may be wide-spread over the whole body, diffuse, general. Following are examples:

"U, the whole body revolted; I felt it all over" (H 56). "An ephemeral sort of P. You feel it all over you . . . the P doesn't seem to attach to anything; you are immersed in it" (H 63). "Quite P, a pervasive feeling-tone. It pretty much fills the whole experience" (H 77). "U, a general feeling of withdrawal, pretty much over the whole body" (H 99). "The U increased and was pretty much all over the body. It was as low as the knees" (H 100). "U . . . it seemed wide-spread" (H 111). "U. I feel that all over; the whole body was involved. It was not general at first but just local" (H 124).

All of the localised feelings of F, G, and K are of the first type. The illustrations of types 2, 3, and 4 are taken entirely from the reports of a single subject (H).

Characterisation of Object-feeling. The object-feeling may now be characterised by (1) a form of report¹³ that refers P-U to an object or identifies P-U with an object, (2) qualita-

¹³ Young, *op. cit.*, 253, 259.

tive differentiations, sometimes described in sensory terms and sometimes as meanings, (3) localisability, (4) compatibility of P and U object-feelings, and (5) the fact that the object-feeling may be attended to,¹⁴ or in the background or focus of consciousness.

Localisation is thus one characteristic of the object-feeling. Object-feelings are *localisable* but not always *localised*.

III. DISCUSSION

Dependence of Qualitative Differences of Feeling Upon Sensory Components. Qualitative differentiations between object-feelings depend upon sensory elements, especially organic and kinaesthetic, which are part of the total "feeling" experience. This dependence is shown in the following:

"I am sure there was a difference in sense-feeling. I found it difficult to separate feeling from sensory component, and I got the impression that there was a quality-difference between the two Ps. The first was soft and voluminous, the second was biting and pungent" (W 124). "The U was more like a pain sensation than like a U feeling. The pain is U, but it doesn't set up the kinaesthesia that usually accompanies intense U" (H 49). "It seems that the organic sensation is the P localised" (H 148). "The P changed somewhat in character; it appears to be organic" (H 155). "There was soothing P. The soothing is kinaesthetic and organic. The kinaesthesia is around the throat and diaphragm" (O 202). "The amusement hang-over seemed kinaesthetic and not feeling. I believe I have before reported the kinaesthesia of amusement as a P feeling" (K 230). "It seems as if I could correlate degree of feeling with degree of something down in the abdomen" (B 182). "P with a stimulating quality in it. I think I could analyse the stimulating quality into bodily things. What it amounts to is that I am suddenly more conscious of the upper part of the body" (G 98). "The U seemed brighter and had more body to it because (I think) I got kinaesthesia in the neck and forehead and pressure about my nostrils" (G 99). "The U seemed brighter because of the bodily context it had" (G 103). "At first I got just cold moving contact, very U, and kinaesthesia in my throat. The U seemed more attached to the sensory components whereas the P had become a more independent state. It was connected more with a widespread bodily complex; it had become more nearly bodily comfort than P" (G 57). "First P in the sense of being satisfied; the bodily counterpart of satisfaction was in the thorax. Then an intense U with a being-disturbed aspect; being-disturbed was being caught in taking a breath, a strong tension in my throat" (G 137.)

So far as our results go, qualitative differentiations of Ps and Us depend upon the sensory elements in a total feeling experience. As to the number and *order* of the elemental affective qualities (abstracted from sensory components and meaning), we await further experimental results.

¹⁴ *Ibid.*, 260.

Dependence of Localisation of Feeling upon Sensory Components. That localisation of feeling depends upon localised sensory components, especially organic and kinaesthetic, may be clearly demonstrated in the case of H. During the first 6 days of the experiment H reported 10 cases of localised feeling (Table II). On day 7 the first 3 reports contained localised feeling, after which O was instructed "to watch and report Ps and Us that have a place or locality." Possibly this instruction acted as a suggestion; for, of the remaining 22 reports given on this day, 18 contained localised feeling! On the following day, having reported 4 localised feelings (the last in the chest region), H was asked: "When you speak of 'feeling' do you mean muscular and organic sensation?" H replied " . . . The P actually seems to come from the chest region; it seems to be there." [Two days later, however, he reported: "It seems that the organic sensation is the P localised" (148).] On this day (day 8) 16 localised feelings were reported out of 26 reports. On the next day (day 9), the second report given was of localised feeling, after which H was instructed "to abstract from organic sensation and report feeling." The instruction was almost immediately carried out, for the change in type of report is very marked. The remaining 16 reports on this day contain not a trace of localised feeling. And throughout the rest of the experiment (except on day 17; see Table II) there is no more localisation of feeling. Just as soon as organic sensation was abstracted, and feeling reported for its own sake, localisation disappeared.¹⁵

With F, localised feeling disappeared (day 15) just as abruptly as with H. The disappearance, however, occurred on the first day that picture stimuli¹⁶ were used. F's feelings had been localised exclusively at the place of the stimulus-object, and when pictures were substituted for odors, tones, tastes, pain, etc., the feelings ceased to be localised. But, quite apart from this sudden change of stimuli, the reports of the latter section are psychological;¹⁷ feeling is reported

¹⁵ H's mixed feelings disappeared after day 6; his localised feelings did not disappear until day 9. The explanation of this disparity is probably that the conditions were not favorable for mixed feeling on days 7, 8, and 9, since the work on these days was with a single stimulus. H's mixed feelings are mainly of the localised object-feeling type.

¹⁶ Picture stimuli seem to be unfavorable to localisation of feeling. Relatively few localised feelings are to be found in the protocols of Kellogg (see Young, *op. cit.*, 259, note 37). Kellogg used visual stimuli exclusively.

¹⁷ Young, *op. cit.*, 252.

for its own sake with no reference to object; no localisation is to be found in this section.

CONCLUSIONS

Störriug's distinction between *Empfindungslust* and *Stimmungslust* thus appears to be a distinction between the unanalysed object-feeling of common-sense, and the psychological report of affection (abstracted from other elements). *Stimmungslust* was obtained by instructing the subjects to abstract from the taste. When P and U are regarded independently, there are no localisation and mixture, for localisation and mixture depend upon the sensory object.

We conclude:

(1) P and U are not localisable. Localisation and extent are characteristics of the unanalysed object-feeling of common-sense.

(2) Localisation and also qualitative differences of feeling depend upon sensory components in the total feeling experience. The popular term "feeling" includes localised sensation as well as meaning.

(3) Localised feelings are reported rarely; six of nine subjects report no unequivocal localisation of feeling. Localised feelings occur in groups sporadically throughout the course of the experiment and in consecutive reports throughout the single experimental hour. The quantitative results show a close relation between localised feelings and mixed feelings.

ARISTOTLE'S OTHER LOGIC

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The science of Euclid's geometry was not infrequently pointed to in times past as a system of truth from which doubt had been forever banished. It was within the domain of space relationships that the greatest of the Pythagoreans had found his eternal truth¹ and for two millenniums following Plato's day the science of space had remained one of the chief strongholds of the absolutist's creed. It was a matter of no small concern, then, to pragmatic philosophy, that this science should in course of time have been successfully denied and other geometries created upon the ruins of the old; for thus had been destroyed in a very critical instance the ancient prejudice that all of the truth about anything can be contained within a single point of view. Cut loose from his geometric, and, as it turned out in the sequel, from his mechanistic moorings as well, the true lover of "things-in-themselves" had little left to turn to save that other science, which, begun by Aristotle, had been completed by the Stagirite within the span of his own life. If the fifth axiom of Euclid was self-evident, how much more that valid syllogism which goes by the name of *Celarent*!

For the benefit of those who may never have heard of those verses within whose cabalistic stanzas lie buried the valid forms of inference, let us spread out the mood to view:

If (major premise) no b is a
and (minor premise) all c is b
then (conclusion) no c is a .

This inference, being true generally, will remain true for special values of the terms. Thus, if b is the same as a , the major premise seems to be untrue for all meanings of the terms, and the professional logician explains this seeming paradox by observing that if an impossibility be true then any conclusion will follow and this particular one along with the rest. If c and a be made identical the conclusion becomes untrue and our syllogism takes the form:

¹ Τοῦ γὰρ αὐτοῦ ὄντος ἡ γεωμετρικὴ γνῶσις ἐστίν.

If (major premise) no b is a
 and (minor premise) all a is b ,
 the (conclusion) an impossibility is true

and this is interpreted to mean that "No a is b " and "All a is b " cannot both be true. If the contradictory of "a proposition that is untrue for all meanings of the terms" be "a proposition that is true for all meanings of the terms," then a familiar logical transformation will yield the result: it is true of necessity that "Some a is b " or that "Some a is not b ."

It is by such devices as these that the "repeaters of Aristotle" might be expected to avoid the pitfalls of special cases and so maintain the complete generality of the science which they profess; and they might have succeeded to the end, had it not been that some ingenious meddler in the affairs of the understanding suddenly produced, and as suddenly held up to view, the notion of a class which has no members, and as illustrations of this hybrid of the imagination, which he called the "null-class," he pointed out the class of triangular circles and the class of alien Americans. Opposed to this class is another, which he called the "universe" and which contains the members of all other classes.

If we push our excavations further within the tumulus of that old mnemonic line there will soon come to light the mood of *Ferio*, and if we take the pains to identify the terms in the conclusion of this mood, it will appear, when spread out on the page, like this:

If (major premise) no b is a
 and (minor premise) some b is a ,
 then (conclusion) an impossibility is true.

At this point we may allow to enter the null-class and the universe in order to try them out as special cases. Suppose that b represent *nothing* (null) and that a represent *everything* (universe). Our syllogism will then have to read:

If (major premise) none of nothing is everything
 and (minor premise) some of nothing is everything,
 then (conclusion) an impossibility is true.

Now, it is commonly taken to be a property of the null-class that its members are contained among the members of any class whatsoever and that they are all completely excluded from among the members of the universe. Hence each premise in this case is a true proposition and consequently this mood of the syllogism is invalid, which is the logician's way

of saying that the conclusion does not follow from the premises. The "repeaters of Aristotle" have always insisted that the two premises in question represent contradictory forms of judgment, by which they mean that one of the two is true of necessity and that they cannot both be true together. But here is an instance of their both being true and no impossibility implied, and to have pointed out such an instance is to have pointed out the necessity of a logic which is not Aristotle's own.

The propositions, which are fundamental in the Aristotelian scheme may be expressed as follows, (representing the four categorical forms, as is usual, by $A(ab)$, $E(ab)$, $I(ab)$, $O(ab)$; the small a standing for subject, the small b for predicate):

- I. $A(ab)$ is true and $O(ab)$ is true is impossible
 $E(ab)$ is true and $I(ab)$ is true is impossible,
 $A(ab)$ is false and $O(ab)$ is false is impossible,
 $E(ab)$ is false and $I(ab)$ is false is impossible,
- II. $A(ab)$ is true and $E(ab)$ is true is impossible,
 $A(ab)$ is false and $E(ab)$ is false is not impossible,
- III. $I(ab)$ is true and $O(ab)$ is true is not impossible,
 $I(ab)$ is false and $O(ab)$ is false is impossible,
- IV. $A(ab)$ is true and $I(ab)$ is true is not impossible,
 $E(ab)$ is true and $O(ab)$ is true is not impossible,
 $A(ab)$ is false and $I(ab)$ is false is not impossible,
 $E(ab)$ is false and $O(ab)$ is false is not impossible.

Propositions I enable us to say that A , O and E , I are *contradictory* pairs; II that A and E are *contraries*; III that I and O are *subcontraries*; IV that A , I and E , O are *subalternate* pairs.

The simplicity of the system depends on the fact that corresponding to any member of the set, A , E , I , O there is another member of the set, which stands for its contradictory; or otherwise, any categorical form, x (is false), may always be replaced by another categorical form, y (is true), and conversely. It will be seen, however, that this advantage is lost, as soon as subject and predicate are assumed capable of taking on the meanings "nothing" and "universe," for under these conditions not all the propositions under I, II, III, IV, remain true.

It is customary, because of this breakdown of the common logic, to regard the classical scheme of inference as one which excludes "nothing" and "universe" as possible meanings of the terms. We wish to indicate that this view is correct, by

pointing out that the traditional science is a special case of a more general system of inference, one, viz., which does not exclude these meanings of the terms, and whose denotation or application is consequently of larger extent.

We observe, in the first place, that *some a is not non-a* is not necessarily a true proposition, in virtue of the fact that there is nothing in the definition of the null-class to prevent our postulating it as false, when *a* stands for "nothing" and *non-a* for "universe."

In such a logic, a logic whose fundamental postulate would be "*some of nothing is not everything is a false proposition*," all of the propositions I-IV, as well as all of the twenty-four moods of the syllogism, which are commonly taken to be valid, remain valid. It might appropriately be called *semi-Aristotelian* logic, because it not only retains all the characteristics of the traditional system but is able as well to interpret those new meanings, which have been introduced into the science since its inception. This name will also serve to distinguish it from a group of logics, whose existence I shall point out in another place, and which would best be called non-Aristotelian, because the characteristic postulate of each member of the group stands in contradiction to those of common logic and to those of each other member of the group.

SIXTEEN ORIGINS OF THE MIND

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Present-day psychology, physiology, philosophy, and theology—not to mention various social sciences and natural sciences—are cast largely in terms of a body-mind dualism. Representative works in each of these branches of learning seem to presuppose a radical distinction between what is called variously physical, material, bodily, non-conscious, objective, and what is called psychic, spiritual, mental, conscious, subjective. Not that the terms grouped together in either member of the division are synonymous; differing connotations render them now one, now another, appropriate for specific uses; but a core of common meaning is recognizable. The man of the street, too, has caught this point of view from the man of the study; and nothing is more common to common thought than the idea of man as having a dual constitution, his mortal frame and the indefinite but intimate tenant thereof.

Various considerations, however, are leading critical minds to question the validity of the distinction as a hard-and-fast one. The problem is one of the deepest and hardest of our science, and its answer necessarily determines strikingly our interpretations of psychological data. We need not go into these considerations, nor the particular sorts of demolitions and reconstructions urged by various critics. But it would be conducive to a clearer apprehension of the general problem to trace back the distinction of mind and body to its manifold roots—roots in unreflective as well as reflective manners of thinking, primitive as well as sophisticated.

'Psychical,' 'spiritual,' 'mental,' 'conscious,' 'subjective,' etc., etc., are words representing a single broad and general category; at the same time they imply different emphases. We may accordingly expect to find that the various human motives that, taken singly, appear more or less sufficiently obvious as the creators of the distinction, when brought together seem rather strange bed-fellows. And we may expect to have to go to a variety of authors for our material.

Our question will be: *What considerations and motives have, or seem to have, led man to the conception of the 'mental,' etc., as a distinct category?* Looking for points wherever

they may be found, we may expect to explore different realms strange and far removed.

1. The earlier anthropologists of the English school have made much out of the primitive savage's perception of certain striking differences in the behavior of his fellows. Certain faculties are manifested by them at some times, not at others. How vastly different are the warrior living and the warrior dead, the mighty man awake and asleep, the same fellow in normal activity and in the puzzling and mysterious trance, even the same one in health and in disease! Phenomena such as these, where the same individual of gross outward appearance seems now freely and positively active, now negatively inert and passive, led to a vague feeling of the alternate presence and absence of some hidden power or agency. And this power or agency came to be felt as the man himself in the most intimate sense, inspiring the body in the moments of its wakeful life, forsaking it temporarily in sleep or permanently at death.

2. This Tylor-Spencer brand of anthropology had ready another interpretation of animism complementary to the preceding. Primitive emotions are easily aroused by the rather puzzling duplications which are to be seen in dreams, visions, and imaginations of the shapes we know in normal life. His comrades and his family are for the savage a part of the day's experiences, but at times he sees these same comrades and family appearing to him in more shadowy and diaphanous as well as more capricious character. Consider also the shadows that stick closer than brothers representing more or less faithfully the human silhouettes and the images-in-pools that give back even more faithful duplicates. There spontaneously arose, consequently, a feeling—we will not say a reasoned belief—that somehow man had his other—his "shade," as it came to be called sometimes among civilized peoples. That there are shocking inconsistencies and lacunae in the thinking here is understood by merely reminding ourselves of the highly impulsive, emotional, and unreflective character of primitive attitudes.

3. In this connection one should remember also the dream theory. Our typical savage lies down in his hunger for a nap. But after the world has begun to swim before his eyes, he may find himself suddenly in the progress of an absorbing hunt, fully equipped and with dog at heels. It may be an exciting chase and the climax may occur with the game laid low. Sooner or later, however, our man finds himself unhappily dispossessed of his winnings and stretched out most

prosaically on the floor of his tepee. He may attempt to describe his adventures to his friends, but they solemnly enough assure him that he has not once left his tent. What is he to make of it, then, unless it was only his outward husk that lay uninterruptedly in the tent as his soul went hunting on?

4. The assumption of indwelling souls in the bodies of others has received partial explanation further in the introjective theory. A observes in the natural course of experience that the actions of various items of his world are very similar to his own behavior, and by crude analogy comes to assume back of actions intents, purposes, ideas such as guide his own behavior. From the observed fact of a similarity of bodily performance there is an inference beyond to states of mind similar to his own. This is an explanation of the development of other minds, and plainly enough presupposes some sort of preliminary recognition of one's mental self. Certainly it is a sophisticated interpretation.

5. The value-aspect of experienced objects as the ground for their assumption of "mental" characters would seem to be more in keeping with the natural movement of naïve thought. According to this doctrine, in all uncritical experience our "objects" are felt to be overflowing with emotional characters: they are first of all *values* and only by cold processes of abstraction bare *things*. The heavy wind, the root that trips us, are obstinate hindrances unfriendly to us; as Santayana says, "Before he is a substance the sun is a god." And animal and human beings, the latter especially, show these characteristics especially well; accordingly they are felt as dynamic agencies in a peculiarly vivid degree. The various emotional dispositions they show are found to be more or less centered and unified at bottom. This unification, again, is more or less in terms of an essence or agent—a *mind* or *soul*.

6. The Greek sophists had made much of the relativity of sense-qualities and hence their subjectivity. To err is mental. A reason commonly assigned by latter-day epistemologists for the development of the conception of the subjective as a more or less distinct realm, is that from illusions and errors. Original experiences are frequently found upon reflection and examination to have been false. At the time, I was seeing my friend approach, yet later evidence proves that it was really a stranger. But he *was* my friend! Now, a single, one-piece, close-knit, neatly self-consistent universe such as the kind we generally assume, most of us, in our daily think-

ing, would have no place for such glaring contradictions. That friend I saw was not really a part of the real world—he was only subjective. Pressed further, this develops into a distinction between the world and the mind, wherein the former becomes a sort of dumping ground for the “erratic residue of experience.”

7. Another source of the subjective, as alleged by present day thinkers, has been called the “physiological argument.” A little study of psychology shows how the sense-qualities of objective things are dependent upon the integrity of the sensory nervous organization of the percipient. But this nervous organization in itself is absolutely unlike the observed qualities; hence it would appear to be an impenetrable barrier between the quality *as observed* and the quality—or whatever it be—as existing in the real world. What are we going to make of it unless we accept such barrier as fact and admit the contemporaneous existence of the world of pure fact and the world of the psychical?

8. But even within the realm of the psychical, say some, a dualism arises. Logicians have made fundamental to their discipline a distinction between subject and object, between knower and known. Mere knowledge standing on its own legs is impossible, it is *ipso facto* known by some one. Conversely, a knower can't exist *per se*, he is a knower of something. Knowledge, then, is a relation, a relation between knower and known, implying both the more or less independent existence of the two terms of the relation and their juncture in some sense by virtue of the knowing function. The knower here has frequently been called the rational self.

9. Not greatly different is the dualism arising from the experiencer or agent that lives through various experiences and the divers experiences themselves. Certain sets of experiences we recognize as somehow all together belonging to Jack, others to James, the Jack experiences naturally joining each other in a continuous series, and the James likewise. This articulation of experiences, this phase of consistency and permanence and progressive organization running through them, has been taken as the self or the purely subjective.

10. Another form of duality may be found within conscious experience. Reflection shows us experience as private and experience as public. As indicated in 6 above, the way things first appear in naive experience shows many manifest inconsistencies; there arises then the motive to construct a standard world. Sciences arise as partly inspired by this motive.

Chronology, for instance, early fixed upon certain more constant periodic changes by which the more capricious might be compared and organized into a self-consistent Time. The world which has come to be received as the real world is that which has been developed by social concurrence and perpetuated by social tradition; while the world that we individually know in its partial aspects and conflicting phases is not real but merely mental. The sun, we know, doesn't rise and set in the real world: its rising and setting is only a subjective fact, it is in the mind.

11. The individual as the source of the subjective is shown in a different way by a general survey of the history of thought. In ancient times institutions were emphasized, and likewise those ideas that were more general and abstract were called the more real. To the Greek, particularly of the Platonic type, the universal was the real, the individual was the unreal. These truer realities, these abstract ideas, came to be hypostasized, if not definitely and unmistakably by Plato at least by the Schoolmen. But with the Renaissance the modern world recognized individuality more, and everything came to be described from the standpoint of personal experience. Individualism became rampant in the 17th, 18th, and 19th centuries; and this warped the current psychology into the brand that took as the most assured realm of reality the 'psychic' 'ideas.' This forms a large share of our 20th century psychological heritage.

12. A more ancient root of the distinction is traceable to the time of the Atomists, and the argument presupposes their metaphysics. Empedocles posited material elements out of which all things are composed. These elements he felt, however, to stand in need of motive power, and love and hate were posited as forces in virtue of which they combined and separated to form the complex items of the world. Anaxagoras went a step farther by finding the principle of combination not in the elements themselves but in a Mind over all, giving them their initial impulsion, leaving them to continue the movement in their higher complexities. Thus, from a consideration of material atoms and their supposed inability to enter of their own accord into combinations to make up the world we know, the mind was hit upon as the source of the needed energy.

13. The Ancients suggested another conception of the soul. It was the 'entelechy' of the body. The essential nature of man's body, its true purpose, was realized in what we call his soul. The body's interests are given expression in its soul.

A modern variant of this theme is the vitalistic conception in which, so it is often said, the true interpretation of the body is to be sought in its *élan vital*, its inherent tendency to strive and push forward, to have life and have it more abundantly. This is the animating soul of the physical body. To approach it directly and intimately we need only look into our own consciousness, where we find non-materiality, non-spatiality, etc.

14. Lately there have arisen thinkers who trace the distinction between the psychical and the physical back to differences discernible in the overtness of actions. The *raison d'être* of ideas, thoughts, etc., is as guides to action; or better, they *are* incipient actions, not yet advanced beyond the mere nascent stage to that full maturity which is overt and observable to others. And an intention that has realized itself, that has passed over into the outward action it foreshadowed, is no longer viewed as a psychical but as a physical process. There is an unbroken continuity of mental and motor life, and the distinction is a relative one. Doubtless a genetic consideration has been operative here: the more primitive organic responses are characterized as nearly mechanical and invariable and stereotyped, whereas with the development of mind, in race and in individual, increasing plasticity and modifiability is evidenced. Description of the former general type in terms of overt and observable behavior may be fairly exhaustive, but the latter, just because they involve an initial element of delay for the decision to be reached, are not in their nascent and crucial stages objective. They are subjective.

15. The analysis of the process of reasoning as it has been made of late years brings out a somewhat different aspect of the same general point. Thinking, it is said, is always evoked by a difficulty, a problematic situation, and its operations are ultimately pointed toward some solution. Many psychological processes are involved here besides those traditionally included under reasoning. Memory, for example, furnishes former experiences as a basis for the development of alternative possible resolutions of the problem, and these alternatives are legitimate products of imagination projected as possible futures. As yet they are only possible, only mental. But when the conflict is ended and an answer adopted and made actual, this adopted course is then real, it is physical.

16. Now for a final suggestion! We may consider those moments so fraught with future consequences when the man of lowly estate learns by chance that he is an efficient agent

in regard to his environment, that he can effect some changes quite on his own account. He has discovered his mind. This realization is spasmodic at first; it is in need of disciplining and man learns his power more accurately through frequent failures. The history of social groups is punctuated by re-discoveries or renewals of this insight. The dawn of the modern era, for instance, is peculiarly well represented by a new realization of the powers of the human reason, even if it be an exaggerated confidence therein, and a search only for the correct *method*. The control and manipulation of outward circumstances, then, may be called the mental, or better, the spiritual, character of our nature, as opposed to the material upon which we operate.

This is a very sketchy survey. It was not intended to elaborate the different points of view but merely to suggest them. In these days of reflective criticism of the category of 'mind,' it may not be without some advantage to have pointed out the different possible sources of the category. That I have given an exhaustive analysis and list I would not pretend. I hope I have carried the division far enough for purposes of suggestion. Which of these motives seem valid—or rather, just what sorts of interpretation of the words 'mental,' 'psychical,' etc., are to be given weight now—that is another question and a fundamental one for psychologists.

MINOR STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF CORNELL UNIVERSITY

Communicated by E. B. TITCHENER, H. P. WELD and E. G. BORING

XLIII. A Preliminary Study of the Psychology of Heat

By F. CUTOLO, JR.

The current view that heat is conditioned upon the simultaneous stimulation of warm and cold spots derives in the main from the work of Alrutz. He employed an areal stimulus which was adequate both to warmth and to paradoxical cold. When this stimulus was applied in a region where there were only cold spots, he found only cold; where there were only warm spots, only warmth; but where there were both cold and warm spots, he found a resulting experience which he calls a *Hitzempfindung* and which he regards as unique and not further analysable. "Pure introspection," he says, "tells me not only that 'hot' is something different in regard to quality from warm, and that hot can very well be experienced without pain (although pain often *does* accompany it), but also that hot is a simple sensation which *generally* cannot be cut up or analysed into component parts."¹

Alrutz also refers to certain experiments of Thunberg which he accepts as supplementing his own. Thunberg had simultaneously stimulated warm and cold spots by means of a flat coil of two small metal tubes. Through the one of these he ran warm, and through the other cold water, the temperatures being 44° and 24° C., respectively. Upon stimulation with this apparatus he got an experience which was "as if the temperature was suddenly raised and a feeling of 'hot' ensued." Coupled with this was "the sensation of a burning sensation about to arise." Thunberg, however, has never accepted Alrutz' notion of the *Hitzempfindung*; on the contrary, he regards the experience as a *Mischempfindung* which has the coloring of the stronger component, and which with sufficient practice may be analysed.² In this opinion he is supported by Kiesow, who explains the rise in intensity of the warmth in Thunberg's experiment as a contrast phenomenon, and the anticipatory "burning" as due to imagination. Kiesow thinks, moreover, that there may be all sorts and degrees of fusion among the various cutaneous qualities, and that cold and pain (whose limen varies at different parts of the body) are of especial significance for the qualitative coloring of these fusions. In illustration of the variation in the limen of pain, he gives the following instance, which, as we shall later see, may be of considerable importance: "Tauche ich die Nagelphalange des linken Zeigefingers in Wasser, das constant auf 49°C. erhalten wird, so bemerke ich nach wenigen Secunden auf der

¹ S. Alrutz, *Upsala Läkareförs. Förhandlr.*, N. F., 2, 1897, 340—359; *Mind*, N. S., 7, 1898, 141—144; *Skand. Arch. f. Physiol.*, 10, 1900, 340.

² Thunberg, *Upsala Läkareförs. Förhandlr.*, N. F., 1, 1896, 489 ff; Nagel's *Handbuch der Physiol. des Menschen*, 3, 1905, 707.

Dorsalseite, an den Rändern, vorn unter dem Nagel ausgesprochenen Schmerz, während dieser auf der Volarseite des Fingergliedes nicht auftritt. Lege ich die Volarseite der Phalange auf die Oberfläche des Wasser, so muss ich dasselbe bis auf 51°—52° erwärmen, um hier Schmerz zu empfinden. Zuweilen kündigt sich dabei die Schmerzempfindung an, *ohne deutlich ausgesprochen zu sein*. Diesen Zustand habe ich als *schmerzbetont* bezeichnet."³

Heat, for Kiesow (who has repeated Alrutz' experiment), is always obtained from temperatures near, at, or above the pain limen, and is therefore either *schmerzbetont* or painful; it is different from the characteristic "vollwarme Empfindung;" and at 45° occurs a complex which sometimes breaks up under analysis into warmth and cold, sometimes shows only a fluctuation of these two qualities.⁴

The issue is plain enough. All three observers agree that with areal stimulation there may be a mixture or fusion of cold and warmth, but they disagree as regards both the simplicity or complexity of the experience and the qualitative nature of heat.

In our own attack upon the problem we have employed two methods of stimulation: (1) a punctiform simultaneous stimulation of warm and cold spots, a method which has not heretofore been used and which would seem to simplify the issue; and (2) a repetition of Thunberg's experiment, substituting for the coil a grill of warm and cold stimuli. The observers were E. G. Boring (B), instructor in psychology, who has had long experience in qualitative descriptions of cutaneous and organic sensation, and J. M. Gleason (G) and M. Kincaid (K), graduate students in psychology. B and K had had previous experience in the analysis of heat, and worked in these experiments with knowledge: G, on the other hand, although an observer of experience, had only a short preliminary practice in the analysis of heat, and worked without knowledge. We shall discuss the two experiments separately.

Series 1. Punctiform Stimulation. We employed, in this series, the Zimmermann thermesthesiometer, with cold water running through the one point, and warm through the other. The temperature of the warm water was always 44° or 45°C;⁵ that of the cold, while constant for a single period, ranged from 8.25° to 13.5°. The flow of water (from large pails) was rapid, and the fall in temperature was never as much as one degree. The temperature of the room during the periods of experimentation ranged between 16° and 21°C. We worked on the forearm. The absolute position of the cold and warm spots was noted in mm. from the carpal folds, and their relative position in terms of the angle of the line which connected them. Directions were indicated as peripheral (P) or towards the wrist, central (C), right (R), left (L). The area of the cutaneous surface was included between cross-lines 2 and 40 mm. from the carpal folds, and the distance between the spots varied from 2 to 9.3 mm. The period of stimulation (measured by a soundless metronome) was for the most part five sec-

³ F. Kiesow, *Zeit. f. Psychol. u. Physiol. d. Sinnesorg.*, 26, 1901, 237 (*italics ours*).

⁴ *Op. cit.*, 237 f.

⁵ We found it necessary to employ these high temperatures in order to secure a definite warmth-response from the warm spots. Our check against both pain and paradoxical cold was introspective and positive. In the preliminaries no observer ever reported either pain or cold when a warm spot alone was stimulated with a temperature of 45°. With dual stimulation of both warm and cold spots, neither pain nor cold was reported at the place where the warmth was localized.

onds. The instruction for B and (in the earlier series) for K read as follows: "After the signals 'ready,' 'now,' a stimulus will be placed on your skin for a short interval. When it has been removed, give as complete an introspective description of the sensory experience as you can. In the description you should enumerate as many sensory components as you can find, and characterise every component as fully as possible." For G and (in the later series) for K, the last phrase of the instruction read "*Describe or characterize every sensory component as fully as possible.*"

Results of Punctiform Stimulation. The experience resulting from this method of stimulation is extraordinarily complex. Warmth, cold, pressure and heat may appear in succession, or two (sometimes three) of them may exist side by side. One component may change in intensity and fade out, and another familiar quality may take its place; a component may suddenly disappear, giving way to a new complex which all but baffles description. No two patterns are ever exactly alike, and the same two spots rarely give the same spatial and temporal patterns at different times even when stimulated with the same intensities. The task set our observers was therefore difficult, and it was made no easier by the general nature of the instruction. For the term "heat" could not be employed without prejudice, and the analysability of every complex was of course assumed. Despite these difficulties, however, all three observers reported the presence of heat or its equivalent. They have furnished us with a provisional description of its nature, and with a general picture of the spatial and temporal patterns for the total period of stimulation. We shall reverse this order in our discussion, and we begin with a few typical introspections:

B. "The heat was set in a fringe of warmth." "First cold, then a flash of warmth, then heat for a long long time; . . . most of the time no warmth or cold with it, but often a faint tinge of warmth, a sort of a halo very weak and thin that came and went. Two or three times . . . a tinge of cool, not a fringe but a little vague blotch, very faint, at one side." "A moderate cold, then strong heat, with a little warmth on one side of the heat and a little cold on the other."

G. "First a stinging heat, a small line of it. Almost immediately a sticky cold came around it, then the entire area got cold. Following this, a flash of heat came back in one spot of the cold area; this then disappeared and a diffuse warmth came round the cold patch." "First a line of intense warmth running on the PC direction; almost immediately, at the end of the line, a little area of cold. Very light contact along the warmth line, and heavier contact at the cold; the former was quite diffuse and irregular, a feathery thing, whereas the latter was compact, round and even. The warmth then spread out over the cold."

K. "Immediately following the initial pressure, quite an intense warmth with a slight pain element, a sharply localised, bright, penetrating, denting sting. This faded out rather abruptly, becoming a more diffused localized warmth, with an adjacent spot of cold." "First pressure at a single point, then warmth at the same point. The latter was very thickly concentrated; it seemed heavy and blunt, not spreading out with faint boundaries as usual. There was perhaps also a tiny pin-point of sting; of this I am not sure. At quite a distance there seemed to be hovering a faint cold; this did not seem to be on the skin but above it."

B reported the temporal order of the components in 24 of the 25 experiments in which he observed. Cold was reported first 21 times, heat twice, and pressure once. The second experience reported was heat 16 times, warmth 7, and cold 2. The third was cold 9 times, heat 4, pressure 2, and warmth once. Cold was at once followed by heat in 65%, by warmth and then heat in 17% of the cases. In two cases cold was followed by warmth and no heat appeared. Heat was most frequently followed by cold (11 times); in 7 cases, however, heat was present when the stimulus was removed.

G observed in 16 experiments, and heat was reported in 9. She was not so certain of the temporal order as was B; frequently two qualities were reported as appearing simultaneously. But, without doubt, the first experience was cold 11 times, heat 3, and warmth 2; the second was warmth 7, heat 4, and cold 2; the third was warmth 4, heat 3 and cold 1. Cold was followed at once by heat in 3 and by warmth and then heat in 3 of the 9 cases. Six times heat was followed by cold; twice by warmth.

K took part in 29 experiments. She was disposed to report the spatial rather than the temporal pattern. It is clear, however, from her introspections that in about half the cases the first impression was a cold pressure, and in the other half warmth either alone or accompanied by "sting." The second experience was most frequently sting either alone or accompanied by warmth; the third was usually cold, although warmth-plus-sting was often present without cold at the close of the experiment.

It will be seen that for all observers cold (aside from pressure) is generally the first quality to appear. This has also been observed by Alrutz, and accords with the fact that the reaction time of cold is shorter than that of warmth.⁶ Another tendency too general to be meaningless is the continuation of cold after heat has disappeared. This was also found with areal stimulation by Alrutz, who supposes that the warmth adapts more quickly than the cold.⁷

The Nature of Heat. B reported heat in 23 of 25 observations, G in 9 of 16, and K reported what we believe to be its equivalent in 18 (possibly 19) of 29. Since we shall have more to say about heat after we have considered the second series of experiments, we shall here merely indicate the nature of the experience as thus far reported.

B began the series by referring to heat as an unique but not necessarily simple experience, the main characteristic of which was a quality something like pressure and something like pain. In the 5th experiment he calls this quality "sting," and describes it further as flat like pressure, bright like pain, and as having the promise but lacking the thrust of pain. Later he employs the term "smack" instead of sting, and describes this as smoother, and thus more like pressure, than pain. These two terms serve for the description of heat throughout the remainder of the series. Some heats are like smack, others like strong sting, some lie between pressure and smack, still others between smack and sting. B came to think of heat, therefore, as a simple quality lying in a series consisting of pressure, smack, sting, and pain; and this is analogous to a color-series like green, greenblue, bluegreen, and blue. In true heat no warmth or cold is discoverable; "psychologi-

⁶ *Mind*, loc. cit., 142; A. Goldscheider, *Ges Abhandl.*, 1, 1898, 299; Thunberg, *Skand. Arch. f. Physiol.*, 11, 1901, 414 f.

⁷ *Mind*, loc. cit., 143.

cally," he says, "it is laughable to think of heat as conditioned upon warm and cold." There are, however, some warm-heats, and he found at least one cold-heat; in these instances heat could be separated by analysis from the warmth or cold and examined alone.

Neither of the other two observers came to the experiment with more than a casual experience with other cutaneous qualities; and although both hit upon the term "sting" for the characterization of heat, and although both reported stings without warmth or cold, neither was able to distinguish clearly between sting and pain. K, indeed, seems at times to have made no distinction between the two experiences, "Cold," she reports, "was followed by pain (i. e., sting; penetrating, concentrated but not very intense)." On other occasions she characterised the experience as "a sharply localised, bright, denting sting;" "a sting, very penetrating, sharp, conical;" "a large, heavy, diffuse pain (sting);" "a sting faint, delicate, slightly denting." G, on the other hand, was content with the description of heat as sting, and did not attempt to relate it to pain. On one occasion, however, she speaks of a "stingy pain," on another of "burning heat," and on two others of "burning pain."

Series 2. Grill Experiments. In this series we employed an areal stimulus, which consisted of a surface made of 8 glass capillary tubes, with warm water running through the even and cold through the odd numbered tubes. These tubes had an outside diameter of 6.5 or 7 mm., and a length of 18 cm. They were laid parallel, and as nearly apposed as the slight imperfections in the surface of the glass would allow, and in this position were fastened by wooden cleats to the board which served as arm-rest. The area between the cleats, 9.5 x 5.6 cm., was the surface employed as stimulus. The ends of the glass tubes were connected by rubber tubing, in the one case with the waste-pipe, in the other with T gas-pipes which in turn were connected with stop-cocks controlling the two streams of water. The warm water was furnished from a galvanized-iron tub holding about 15 gals.; the temperature, constant for an experiment, varied throughout the series from 43° to 45°C. The cold water came directly from the tap of the water supply, and ranged in temperature from 5° to 9°C. The procedure was as follows: O laid his forearm (occasionally his hand) on the grill, and the warm water was turned on and allowed to run until warmth was reported. Then the signal "now" was given, and the cold water was also turned on. The instructions were: "The experimenter will adjust the apparatus until you feel only warmth (and pressure) from the grill. At the signal "now" close your eyes and note the course of the sensation that ensues upon the warmth. If it is of any assistance to you, keep up a running verbal account aloud while the changes are in progress. After the trial you will be asked to describe the complete experience. Enumerate the sensory components and characterise them whenever possible, especially with regard to quality." All observers accepted the suggestion of the instruction, and gave running verbal accounts of the experience during its course. For this reason the time of application of the stimulus was indefinite, depending upon the nature of the report.

We had no intention of carrying out a carefully controlled series of experiments with this method. We hoped (1) to find an easy means of demonstrating the fact that heat may be derived from a simultaneous stimulation by warm and cold. We desired (2) to control for purposes of observation the course of the psychological experience (we could begin or end the period of stimulation with either warm or

cold, or both, or neither). And we were interested (3) in comparing the qualitative results thus obtained with those found by punctiform stimulation.

Results of the Grill Experiments. We found that this method is excellent for demonstration. The apparatus is simple in construction, and even the untrained observer can easily convince himself that heat derives from warm and cold stimulation. Moreover, the temporal course of the experience was under control; it could be made to begin with warmth, instead of with cold as in the punctiform series; and when cold ensued after heat, it is possible to reverse the order of change by turning off the cold and allowing the warm water to continue running. B did not generally report the temporal patterns; but G found that heat without cold always followed the initial warmth, except when the temperature of the cold water was as low as 5°, in which case heat came with cold. In 6 of 11 cases the initial warmth was reported to increase in intensity before heat came in, and in one instance "pain" appeared before the signal "now," i. e., before the cold stimulus was applied. K also reported "sting" as the second experience in the majority of cases, and cold-plus-sting twice. She also found warmth present with sting twice before the signal "now." This latter experience is to be expected, since the temperature of the warm water was adequate to paradoxical cold.

All observers report heat (sting, stingy-pain) without temperature; heat with cold or warmth present but spatially different; warm-heats, and cold-heats. B substantiates his results obtained by punctiform stimulation, and concludes that "true heat" is a simple pressure-pain quality, with no trace of warmth or cold in it, and that warm-heat and cold-heat are fusions. He thinks that normal heat, the typical heat of every-day life, is a warm-heat or heat with warmth fringes or halos; and that cold-heat definitely carries the meaning of heat, and yet has cold in it instead of the typical component of warmth. Finally, he is less sure of the applicability of the terms "smack" and "sting" to the description of heat. He says: "they seem a little more complex than when I first used them;" and again, "I tried hard to get a better description of heat but without success. "Smack" is good, but it doesn't seem persistent enough; 'tear' is all right, but it doesn't seem penetrating enough; 'drawing' is all right, but it sounds as if it might be just pressure." "It's a true pressure-pain, I am sure, and it is not at all a true pressure or a true pain. It is between pressure and the painful part of ache. A drawing, tearing quality is the best I can do for heat verbally." K continues to employ the term "sting," apparently with the meaning of pain; and G, in this series, always uses the terms "stingy pain" or "burning pain," and characterises the latter as a stingy pain with warmth in it.

Conclusion. We agree with Alrutz that heat, a cutaneous quality that is neither warmth nor cold, may result from the simultaneous stimulation of warm and cold spots. We do not agree with Thunberg that heat is a *Mischempfindung*; we find, rather that heat itself mixes and fuses with warmth or cold; that there may be spatial mixtures, and probably fusions of warm and heat or of cold and heat at the same place. But our observers are not agreed as regards the presence of the quality of pain in the experience of heat: our most experienced observer, B, believes with Alrutz that heat may occur without pain; whereas our other observers employ the terms sting and stingy pain

to characterise the experience.⁸ These two observers, therefore, would support the contention of Kiesow. We are inclined, however, to accept the view that true heat is not true pain. For (1) neither of our two observers who report the experience as "sting," meaning thereby pain, has had more than a casual acquaintance with the qualities of pain. These observers were not, therefore, adequately prepared to distinguish between true pain and heat. (2) The meaning of heat in everyday life is undoubtedly associated with pain; so that even if heat may exist without pain, it nevertheless points towards pain. (3) This fact, taken together with B's characterization of psychological heat as a quality lying between pressure and pain, makes intelligible Thunberg's "sensation of a burning sensation about to arise," B's expression "heat with a promise of pain," and Kiesow's *schmersbetonte Empfindung*. We do not, however, regard the matter as settled. Kiesow's contention that heat can be obtained only with stimuli near, at, or above the pain limen, can be fully met only by reproducing the experiences reported in this paper with stimuli that are beyond the shadow of a doubt inadequate to pain; i. e., with a warm stimulus that is inadequate to paradoxical cold, and with a cold stimulus that proves experimentally to be inadequate to ache in the region of the cutaneous surface chosen for experimentation. The next logical step along the lines of this investigation is accordingly the correlation of heat and its fusions with various combinations of temperatures of warm and cold stimuli.

⁸ It may be said that B was disposed *a priori* to find heat "a pain" or "pain." His descriptive report was, therefore, contrary to the lines of autosuggestion.

THE MENTAL DUET

By ARTHUR S. PHELPS

Are there a masculine and a feminine mind? Do men and women differ by nature? If their eyes catch the same picture, do their brains offer the same impression to the mind? Modern psychology tells us that the influence of the brain over the mind is enormous. The materialist declares that this influence is determinative,—indeed, that thought is only as a mist rising on the surface of the cerebellum. While sane philosophy generally rejects this view, it still recognizes that bodily conditions, and particularly the cells in the brain, exert a powerful influence upon ratiocination, that they produce habits of thought. And through thought, action. And through action, destiny.

Animal life began most simply. The amoeba, at maturity, parted in twain. His children were all twins. His type increased by arithmetical progression. Biology tells us that sex was first determined by nourishment. The best nourished individuals became females, the more meagre, males. This achievement of the Creator's evolutionary process required millenniums of natural selection. The "Little Carpenter," as Huxley charmingly pictures the unseen life-force, works very slowly. But none the less surely, and progressively.

And thus there grew up what we may call the distributive and the secretive temperaments. Nourishment still dominates. These temperaments are the masculine and the feminine genius, respectively. Science names them katabolism and anabolism. They are the spending and hoarding faculties in nature's economy. The masculine element is a constant tearing down and wasting away. The feminine element is receptive, edificative. Anthropology has written the history of these bipolar, reciprocative forces. Competition declares it to be a duel. Antagonism. Co-operation proves it to be a duet. The novel has popularized this story of the katabolic and anabolic temperaments in man and woman. Man lays himself at woman's feet; she accepts him. Some one has said that the story of every novel is, "She was beautiful and he fell in love." How little the hero and heroine know that the eternal sweep of agelong destiny has conveyed heart to heart across meeting lips! The very stars fight for them—particularly the moon.

What term has psychology to mark the difference in mental processes betwixt the man and the woman. Katabolism it calls reason; anabolism it calls intuition. Reason is the sacrificial, the fighting temper of the mind. Intuition is the receptive temper. The one hunts truth; the other entertains it. The instrument of the former is logic. The instrument of the latter is feeling. Logic contains two elements, inductive and deductive. Intuition contains two elements, instinct and imagination.

This mental distinction had its origin in natural causes. The male was stronger physically than the female, and could force his ideas and her submission. Finding physical superiority denied her, woman, through generations of submission, has gradually built up a matchless weapon of defence. It is her intuition. The processes of reason

are slower. Man has had time, given him by his physical superiority, to develop his conclusions by inductive and deductive reasoning. Against the invincible arm of the male animal, rose the quick wit of the female animal. It was her only defence.

Who shall say to-day which mental method is superior, the man's or the woman's? Is reason a higher faculty than intuition? Is intuition more sure than reason? Man suspects the conclusions of woman's intuition, because they are so rapid. She suspects the conclusions of man's reasoning, because it is so slow. If either be higher than the other, then one sex is more advanced in the evolutionary process than its companion. They are twin elements. They are parallel streams from the same spring. Each is found in its measure in the well balanced mind. But the predominating faculty of man is reason. Of woman it is intuition. That is why they cannot take each other's place in the world. That is why a normal woman cannot serve on a jury. That is why a man cannot say the last word on moral issues. For the one, reason is demanded; for the other, intuition. The two temperaments are mutually reciprocal. There is a large sphere of truth—perhaps half of it—open to reason. There are great continents of truth, the large domain of metaphysics, that reason cannot explore without the lantern of intuition.

While we think of the masculine and feminine minds as diverse, one doing its work with the tool of reason, the other with the tool of feeling, yet they are one in their origin; one in their conclusions, though differing in their methods. Man and woman, hand in hand, with wandering steps and slow, like children in the night in a great and trackless forest, set their faces toward the golden gates of the Temple of Truth, their faces lighted by hope, their steps made strong by mutual encouragement, their hearts guided by the divine wisdom of the unseen Father.

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BOOK REVIEWS

Le Génie féminin français. By MARTHE BORELLY. Paris, Boccard, 300 p.

In her well-written book, Marthe Borelly examines what are the limits of woman's personality and what her true place in society is, what it was in the past, what it must and will be after the war. The book contains also an interesting study of love, and the relation existing between love and fashion.

The author does not admit the principle of the equality of the sexes. "Nature," she says, "has made man and woman complementary." It established a law of necessity and not of equality. Marthe Borelly has no sympathy for the suffragists. She seeks to direct the future of her sex along the path marked out by the highest feminine culture of the past.

For many people, the ideas of the author will perhaps appear to be old fashioned, but she expresses the views of the majority of French womanhood. While not a scientific treatise, the book is very well written and is completely free from hysteria, which is so common in discussions of the woman question.

M. P.

Le Sens de la mort. By PAUL BOURGET. Paris, Plon, 1916. 328 p.

One of the books most read in France since 1916 and also one of the most commented on is this stirring meditation, *Le Sens de la mort*, upon a topic that the immense and frightful war brings constantly to our thoughts.

The author of "Le Disciple" and "Les Essais de Psychologie Contemporaine" shows us on one side a superior man, a great physician. He is atheistic, he denies the spiritual forces and believes only in the positive ones. Death stands suddenly before him. He cannot adapt himself to it. "He accepts it with courage, but it is a courage formed of crushed resignation. It is his intellect bowing, with a desperate impotence, under the action of irresistible and supreme forces, for him monstrous, because they created him only to crush him." On the other side, Bourget shows a young French officer, with a culture not far removed from the physician's culture, but the young man believes in God, in a future life, in a salvation "which is to keep living the best of ourselves." He is wounded, he knows death is coming, his doctrine allows him and gives him the strength to accept it, he adapts himself to it. Then where the other sinks, he triumphs. For the former one death is "an absurd catastrophe," for the latter it is a "consummation, an accomplishment." And Bourget affirms that "Death has no meaning if it is but an end, it has one, if it is a sacrifice."

Le Sens de la mort not only brings forth a very interesting problem of religious psychology but it can be interpreted as a sign of the new spirit which is being born in France.

M. P.

Mors et Vita. By ALFRED LOISY. Paris, Nourry, 1916. 86 p.

Mr. Loisy, the author of this little book, is a former catholic priest who, following the example of Renan, broke with the church because he could no longer blindly believe in the Roman Catholic dogmas.

Mors et Vita is a criticism of the two famous works: *Le Sens de la Mort*, by Paul Bourget, and *Le Voyage du Centurion*, by Ernest Psichari, works that are representative of the so-called "*Mouvement Catholique Moderniste*," now taking place in France and which includes numerous French authors like Bourget, Barrès, Bazin, a movement which is so brilliantly illustrated by the "ultimate sacrifice" of young French intellectuals, among them Péguy and Psichari, the latter a grandson of the great apostate Renan, both of these young men converted to the Roman Catholic Church and killed on the Field of Honor.

The criticism of Loisy is extremely keen. The author transports into the apologetical field what through the writings of Psichari and Bourget thousands of young Frenchmen feel intuitively and instinctively.

Loisy tries to demonstrate that nothing very strong binds the renewal of the French spirit to the Catholic dogmas. He declares, however, that a great number of young men, not less ignorant of doctrinal and theological Catholicism than Ernest Psichari, adhere to the church as a result of the horror they feel for the moral emptiness of our non-religious society before the war. Renan, he says, had above all experienced the church intellectually; Ernest Psichari and men like him have experienced the century as "impressionists" and through the feelings and realizing its inadequacy, he turned to the church. "The question," continues Loisy, "would be to know if the traditional center of our moral life would not tend to displace itself, and if a 'nation of souls' may not be in the making, not against the old religious confessions, but outside of them and especially of the Catholic church."

M. P.

Gaspard, By RENÉ BENJAMIN. Paris, Fayard, 1915.

Among the numerous vivid books that have been written by soldiers from their own experiences during the war, *Gaspard* may be counted as one of the best.

Gaspard is a product of Paris. He joined his regiment in the beginning of the war, and among hardships and misfortunes, while engaged in battles, his spirit always joyful, his clever, lively, ingenuous repartées, so characteristic of the Parisian, keep the spirit of his comrades always high. He is intelligent and equal to any emergency, he derives advantage from anything and makes the best of bad situations. He is patriotic and understands why he is fighting. He is the real type of the French soldier.

The reading of Mr. Benjamin's book would be very useful for those who are interested in psychology of soldiers.

M. P.

L'Avenir de l'Intelligence. By CHARLES MAURRAS. 2nd ed. Paris, Nouvelle Libr. Nationale, 1917.

According to Maurras, intelligence, which is a predominant function of the brain and which expresses itself by writing is likely to lose its rôle and dignity. It is in danger of falling more and more under material influences; gold will master it, enslave it and domesticate it. One of the causes of this situation is that Romanticism is developing in the direction of the most unrestrained and narrow individualism. Maurras suggests some political remedies, among them the rule established by the genius of Auguste Comte. This gives Maurras an op-

portunity to make a very interesting study of the founder of positivism and of his philosophy.

M. P.

Les Diverses Familles Spirituelles de la France. Paris. EMILE PAUL, 1917. 312 p.

The new book of Mr. Barrès, the eminent academician and President of the French Ligue des Patriotes, contains a series of articles which were published last year in the French newspaper *l'Echo de Paris*. It describes the different spiritual groups which go to make up the French people—the Catholics, the Protestants, the Jews, the Socialists, the Traditionalists. He portrays the changes that have taken place among them under the influence of the war. It is a eulogy of the Union Sacrée, that arose in August, 1914, out of the deep patriotism of the French people, after the battle of the Marne, the Union Sacrée was very near being wrecked by the too great confidence and optimism that prevailed in France. It has renewed its strength in the last three years, the present union is stronger, deeper, firmer, of a better quality than the first one. "It consists not," says Barrès, "in disavowing our beliefs, or in relegating them to a limbo, like a useless article. It consists of everything that strengthens our confidence, it consists of those deeply rooted beliefs that bind men to the eternal verities. Each of the spiritual groups has maintained its own rights and ideals but in their purest form and as a result of this has not interfered with the full cooperation of all the groups."

Mr. Barrès has built up his theme on the best materials, with written testimonies of fighters, letters of soldiers, many of which he reproduces. He has collected them from all parts of France.

The book is perhaps the most stirring and valuable work on the new spirit of France, that has been published since the beginning of the war.

M. P.

L'ILLUSTRATION. Paris. An illustrated weekly.

L'Illustration is a French illustrated weekly. All its pages are devoted since the beginning of the war to war articles. Every number brings an editorial by Mr. Henry Lavedan, the well known French academician, on a topic of immediate interest. For instance, in the numbers of June he describes the effects upon the people of Paris of the big gun bombardment. After this follow studies on the military, political, moral situation of France and her allies.

All the articles are illustrated by well known French artists and the mechanical work of reproduction cannot be surpassed.

A complete file of this valuable paper covering the period of the war will be a veritable mine for the psychologist and it is to be hoped it will find its way eventually into all psychological laboratories devoted to research.

M. P.

Ma Piece and Le Tube 1233. By PAUL LINTIER. Paris, Plon, 1916-1917. 300 p.

Among the numerous French and foreign books published since the beginning of the war, describing the life of the soldiers at the front, there are two, written by a soldier himself, at the front, sometimes between bombardments, at other times inside a dug-out, by the light of a candle, which are really masterpieces, not only for the literary point of view but also for the scientific point, because they are the real expression of truth. They are an important contribution to the psychological study of the soldier in time of war.

They are reports of battles, taken from day to day, from the mobilization up to the time of the glorious death of the author. One lives with him the feverish days of the beginning of the war—one starts for the front, amidst the cheers of the populace, one arrives at the firing line and one feels the emotion of being for the first time under fire. One revolts sometimes in having to retreat, when the position seems to be assured, and one realizes only afterwards that in formidable battles, one is only a small part of a great all. One lives the battle of the Marne, the victory and afterwards the tenacious and patient war of position, one cooperates in bringing a gun into position—one takes part in the construction of the casemates; one understands the attachment of the soldiers to their officers.

In the "*Le Tube 1233*" (which is the number of the gun) the author continues his observations and descriptions. One meets again the old battery, this time in Alsace, near the Hartmansweilerkopf, in the winter. One lives the sometimes monotonous life of the "poilu" in this sector and one agrees with Lintier when he says: "One of the surest characteristics of the present struggle is its tedious uniformity, danger, the death present nearly always in the same manner. One shell seems no more than another shell. And when the risk becomes less immediate, or when the threat of death diminishes, how poor then is our existence and how devoid of contingencies! The abrupt return of danger, the contact even with death is no more unexpected. Indeed, weariness will not have been one of the smallest hardships that the soldiers of this war suffer from."

"To be sincere, the diary of a fighter must express much monotony."

The morning of his death, Paul Lintier wrote still: "The barber of the battery arrived near midday, on his bicycle, with his shears and razors. At the front of the dug-out of the first gun, where the observation balloons cannot detect us, there is a table and a seat in the sun. Seated in a circle, on the ground, one talks while the barber is busy shaving and cutting hair. A German battery shoots. Reprisals upon Fossieux. Twenty-five shells per gun . . ." And the publisher of the book adds:

"Here end the unfinished pages of "*Le Tube 1233*." In the afternoon of the 15th of March, 1916, Paul Lintier fell under a German grenade. His latest war notes, picked up on his bleeding body, have been put together by the care of his friends and war comrades."

It is interesting to compare the two books of Paul Lintier with the much known "*Le Feu*," (Under Fire) of Barbusse. *Under Fire* shows us the war only on its most horrible side, its most depressing. There are regrettable omissions in that book and inexcusable exaggerations in these times when we need all the possible comfort to face the hard necessities of the great struggle. The soldier of Barbusse is a real slave. The splendid conduct and the superior spirit of the fighters are with the books of Sergeant Major Paul Lintier the best reply to such writings as those of Barbusse.

There remains from reading "*Ma Pièce*," and "*Le Tube 1233*," a great admiration for the "poilus" and a confident optimism in the valor, sacrifice and patriotism of our soldiers.

Those who wish to study the psychology of the soldiers would make a great mistake in confining themselves to such works as "*Le Feu*," which have obtained an unmerited success; they could not do better than to read the works of writers like P. Lintier, Ern. Psichari, Ch. Péguy and others who have fought and died in early manhood, leaving behind them faithful records of the life of the soldier in this great and glorious conflict.

M. P.

BOOK NOTES

Human nature and its remaking. By WILLIAM ERNEST HOCKING. New Haven, Yale University Press, 1918. 434 p.

The author says his work is that of the quarryman with his blasting powder, rather than that of the sculptor with his chisel. We are only now beginning to learn the technique of dealing with the old problem of human nature, and with larger masses. Part I is devoted to orientation, an art peculiar to man, the emergence of problems, the possibility of changing human nature, what changes are desirable, liberation versus discipline. Part II is the natural man, the elements of human nature, the range of reason, survey of the human equipment, central instincts, the will, and the writer even dares to append a note on Freud. Part III is conscience, the interest in justice, its relations to general will and instinct, current fallacies regarding sin, which is blindness and untruth, why men sin, sin as a status. Part IV is experience, the agencies of remaking tasks and methods of experience, the dialectics of pugnacity. Part V is society, social modelling, main distinctions of social modelling, ideals and their recommenders, laws and the state, institutions and change, education, the right of punishment. Part VI, art and religion, the voice of God, public and private order, society and beyond society, the world of rebirth, the sacred law, art and human nature, religion *per se*. Part VII is Christianity, what it requires, its relations to pugnacity, sex love, ambition, its crux, the theory of participation, the divine aggression, the last fact.

This book makes a peculiar impression upon the thoughtful reader. The author has grasped the great idea that is coming home to cultivated men in so many fields of life now, that the chief study of mankind is man, and that we must not lose ourselves in specializations that obscure the larger meanings of life or destroy perspective and make larger orientation impossible. On the other hand, the enormous field the writer attempts to cover in these pages is simply appalling and shows that the author's attitude is essentially pedagogic, even more than it is philosophical. Perhaps this kind of work is necessary for students, but to our thinking it is hardly scientific, in the new, higher sense that is supervening in this field; nor does it entirely escape the danger of leaving the student with a somewhat paralyzing sense of finality which must interfere with his further growth. There is some similarity between works like this and the tremendously comprehensive systems of philosophy, and perhaps ethics, that a couple of generations ago made the staple of academic teaching.

The new rationalism; the development of a constructive realism upon the basis of modern logic and science, and through the criticism of opposed philosophical systems. By EDWARD GLEASON SPAULDING. New York, Henry Holt & Co., 1918. 532 p.

While there are many ways of studying philosophy, the point of view and method here has been of too infrequent use. The author notes that at present there is far deeper interest in systematic than in the historical treatment of philosophy, although the latter method should always be present, if always subordinate. The result of a mainly historical method is that the student is perplexed by the multiplicity of systems which are disclosed. What he really ought to know

is what those postulates from which each philosophical system is logically derivable are, and also whether there is one body of principles common to all systems and logically pre-supposed by them. This latter is the author's view and he attempts to give such principles. Accordingly, he treats, in successive sections, the problem of the point of view, historical problems, methods, the latter subject being very fully treated. In Part II we have the causation philosophies, phenomenalism, subjective idealism, positivism, materialism, pragmatism. Then the substance philosophies follow, viz., those of objective idealism. Then follows a discussion of realism and the function philosophies, involving the hypotheses and principles of realism, its form as constructive and detailed. This work is a contribution of real value.

The exceptional child. By MAXIMILIAN P. E. GROSZMANN. New York, Charles Scribner's Sons, (c. 1917). 764 p.

This author has for many years been an eminent and successful worker in the field which this book represents, and his conclusions will be welcome and profitable to all those who are interested in the subject. He says his purpose is to give a perspective of the entire situation, and to suggest ways and means of coping with the problem in its various aspects. In Part I he treats the problem of the individual child, discussing education in general, then inefficiency, different civilization levels in modern society, classification and terminology, the normal and potentially normal child, the exceptionally bright child, psychopathic disorders and constitution, feeble-minded groups, treatment of delinquency, sex perversion and prostitution. Part II is devoted to the problem of clinical research and diagnosis, and he discusses here the differentiation of exceptional development of children, standardization, the Binet scale, the meaning of an educational clinic, schedule of tests. Part III concerns the problem of prevention, adjustment, organization; and here he treats the legal provisions, eugenic considerations, including marriage and heredity, home life and training, school problems, kindergarten period, general provisions for variations from type, provisions for exceptional children, sanatoria, and atypical children, and the training of teachers. In an appendix he treats of the city and her boys and gives us a medical symposium by many different writers.

Universal training for citizenship and public service. By WILLIAM H. ALLEN. New York, Macmillan Co., 1917. 281 p.

"Until-after-the-war" is a new word and a qualification for all our thinking and planning. All kinds of ideals will be realized after the war, and so the author discusses the new patriotism, its menace if unrestrained, the cost of unpreparedness, universal training for citizenship is possible, the essential minima, training for volunteer civic work, for drill-masters and teachers, for lectureships, for entrance into the civil service, for the professions, for a continuance in public and quasi-public service, specialized training in parenthood, the especially gifted. The future of American democracy is magnificent but it has its price and conditions as well as rewards. Each must prove his title clear to American citizenship by learning, liking and living the arts of public service.

Religious education and American democracy. By WALTER SCOTT ATHEARN. Boston, Pilgrim Press, (c. 1917). 394 p.

The present war will have been waged in vain if it hands democracy over to an ignorant and godless people. Intelligence and godliness

must become the common possession of the whole human race. Hence the author attempts to develop a constructive program of religious education for the American people, also to analyze existing organizations and agencies, to determine our present educational assets and liabilities; and third, to survey the available literature on the various problems involved in a nation-wide program of religious education. Interesting chapters are on the correlation of church and public schools; community system of religious education; the unification of educational agencies; the college and religious education; the graduate school.

An elementary handbook of logic. By JOHN J. TOOHEY. New York, Schwartz, Kirwin and Fauss (c 1918). 241 p.

This work being elementary, omits the subtler questions that frequently find an extended place in treatises on logic. It is not designed for private study but for the classroom and leaves detailed explanation of the various topics to the teacher. It has two distinctive features, (1), distinguishing between the act of inference and the process of inference, each being given a special chapter; and (2), the hypothesis of the distribution of the predicate has been abandoned.

Studies in the history of ideas. Edited by the Department of Philosophy of Columbia University. Vol. I. New York, Columbia University Press, 1918. 272 p.

This is volume one of the collection of studies in the history of philosophy, the present volume containing thirteen different papers, by as many different writers, e. g., M. T. McClure, Appearance and Reality in Greek Philosophy; W. T. Bush, An Impression of Greek Political Philosophy; John Dewey, Motivation of Hobbes' Political Philosophy; H. G. Lord, The Attempt of Hobbes to Base Ethics on Psychology; and F. J. E. Woodbridge, Berkeley's Realism.

Proceedings of the American Society for Psychical Research. Vol. XII, June, 1918. New York, American Soc. for Psychical Research, 1918. 735 p.

This volume is entirely devoted to the Smeade case by James H. Hyslop, Ph. D. The first part is a general summary, ending at page 175, while the rest of the work consists of appendices.

What men live by, and other tales. By LEO TOLSTOI. Translated by L. and A. Maude. Boston, Stratford Co., 1918. 66 p.

AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY

Dr. Ales Hrdlicka, with a distinguished list of associate editors, has founded and issued two numbers of a new journal, the American Journal of Physical Anthropology. It was a bold enterprise to inaugurate such a journal in these war times, when all editors of scientific periodicals are finding their subscription lists reduced and prices of publication increased. There was, however, not only ample room but real need for such a journal, and not only psychologists, physicians and educators, but all students of and workers on the raw material of human nature will welcome this journal, especially if it can maintain itself on the high level which the first two numbers take, as its board of editors leave no doubt will be the case.

INDEX OF SUBJECTS

(The subject headings of all contributions except Book Reviews and Notes are printed in SMALL CAPITALS.)

AESTHETIC JUDGMENT OF PICTURES,	333	Escapes, Romance of,	125
— UNITY,	291	Ethical philosophy of life,	350
AMERICAN PSYCHOLOGICAL ASSOCIATION, PRESIDENTS OF,	347	Exceptional child,	456
ARISTOTLE'S OTHER LOGIC,	431	FEELING, AND ASSOCIATION-TIME, 187; LOCALISATION OF,	420
ASSOCIATION TIME AND FEELING,	187	FRENCH ORIGINS OF AMERICAN TRANSCENDENTALISM,	50; PHILOSOPHY SINCE THE
ATTENTION, MEASUREMENT OF,	122, 204	WAR, 393; woman,	451
AUDITORY DISTRACTION, EFFECT OF, UPON THE SENSORY REACTION,	129	FRESHMEN, STUDY OF,	327
Behaviour, Psychology of,	235	Future of intelligence,	452
BIOLOGICAL VALUE OF RELIGIOUS BELIEF,	383	"Gaspard,"	452
Child study,	456	Geometry, Study of,	235
CHILDREN, RELIGIOUS AND MORAL DISCIPLINE OF,	371	HEAT, PSYCHOLOGY OF,	442
CHILKAT CULTURE,	66	HUMAN MIND, 272; nature and its remaking,	455
Citizenship, Training for,	456	Ideas, History of,	457
CLEARNESS, ATTRIBUTIVE,	204	"L'Illustration,"	453
Color, Language of,	352	INFANCY, PROLONGED,	196
COLORS, "RETIRING" AND "ADVANCING,"	182	Instinct,	235
COMTE, PSYCHO-ANALYSIS OF,	159	INTELLECTUALISM VERSUS INTUITIONISM IN FRENCH PHILOSOPHY,	393
Conduct and moral values,	234	Intelligence measured by	
CONSTANT STIMULI, CHECKING TABLE FOR,	120	Stanford revision,	352
Conviction, Psychology of,	350	INTROSPECTION,	214
CUTANEOUS PATTERNS BELOW THE TWO-POINT LIMEN,	400	Jesus, Life of, 125; of history,	125
Death, Sense of,	451	Learning of children, 126; VARIABILITIES AND CORRELATIONS IN,	316
DICKENS' PSYCHOLOGICAL ATTITUDE TOWARD SURNAMES,	337	Life, Origin and evolution of,	124
DISCRIMINATION OF CUTANEOUS PATTERNS BELOW THE TWO-POINT LIMEN,	400	LIMEN, CALCULATION OF AN ASSOCIATIVE,	219
DISTRACTION, AUDITORY, AND SENSORY REACTION,	129	LOCALISATION OF FEELING,	420
Dynamic psychology,	352	LOGIC, ARISTOTLE'S OTHER, 431; Handbook of,	457
Edgar Chapel, Glastonbury,	351	MANAISM,	I
Educational psychology,	125	Mankind, racial values,	125
		"Ma Piece,"	453

INDEX OF SUBJECTS

MEDIUM IN BUD,	144	RELIGION, PSYCHOLOGY OF,	1
Mental diseases, 127; DUET,		RELIGIOUS AND MORAL DISCIPLINE OF CHILDREN, 371;	
449; survey, 352; tests, 352;		BELIEF, BIOLOGICAL VALUE OF, 383; education, 126;	
troubles of war, 126; WORK AND VISUAL MEMORY IMAGE, 355		education and democracy, 456	
MIND, HUMAN, 272; SIXTEEN ORIGINS,	435	RHYTHM, BIBLIOGRAPHY OF,	214
MIXED FEELINGS,	237	School work, Special,	126
Moral values and conduct,	234	SENSORY REACTION, EFFECT OF AUDITORY DISTRACTION UPON THE,	129
Nervous diseases,	127	SPELLERS, VERBAL ABILITY OF POOR,	331
Neurology, Laboratory outline,	235	SPIRITISM,	144
New rationalism,	455	Spiritual groups of France,	453
Nietzsche,	124	Stanford revision of Binet-scale,	352
Origin of life,	124	SURNAMES, DICKENS' PSYCHOLOGICAL ATTITUDE TOWARD,	337
ORIGINS OF THE MIND,	435	Taste,	124
PARADOXICAL ERROR IN TWO-POINT LIMEN,	227	Training for citizenship,	456
Personality and religious faith,	234	"Le Tube," 1233,	453
PHILOSOPHY, FRENCH, SINCE THE WAR, 393; History of, 457; Outline of,	350	TRANSCENDENTALISM,	50
Preaching, Psychology and,	351	UNITY, AESTHETIC,	291
PROLONGED INFANCY,	196	VARIABILITIES AND CORRELATIONS IN LEARNING,	316
Psychical phenomena of war, 351; research, 233,	457	VERBAL ABILITY OF POOR SPELLERS,	331
PSYCHOANALYTIC STUDY OF AUGUSTE COMTE,	159	VISUAL MEMORY IMAGE, INFLUENCE OF MENTAL WORK ON,	355
Psychology, 126, 234, 352; Dynamic, 352; Educational, 125; of behaviour, 235; of conviction, 350 OF HEAT,	442	Vital function testing methods,	352
PSYCHOMETRIC FUNCTION FOR THE TWO-POINT LIMEN,	227	WAR, Mental troubles of, 126; Psychical phenomena of, 351; shock,	127
Racial values of Mankind,	125	WEBER'S ILLUSION,	81
Rationalism, The new,	455		
RECAPITULATION THEORY,	371		

INDEX OF AUTHORS

(The names of authors of original contributions are printed in
SMALL CAPITALS.)

Adler, Felix	350	GLASCOCK, JOSEPHINE	333
Allen, William H.	456	Glover, T. R.	125
Anderson, Margaret M.	353	Goldberg, Isaac	353
Athearn, Walter Scott	456	Gordon, Kate	125
		GOUDGE, MABEL ENSWORTH	81
Barton, Wilfrid M.	352	Groszmann, Maximilian P. E.	456
Baudin, E.	352		
Benjamin, René	452	HALL, G. STANLEY	144
BERLINER, ANNA	355	Herrick, C. Judson	235
BLANCHARD, PHYLLIS	159	Hocking, William Ernest	455
Bond, Frederick Bligh	351	Hollingworth, H. L.	124
Borelly, Marthe	451	Hollingworth, Leta S.	353
BORING, E. G.	219, 227, 442	Hopkins, Tighe	125
Bourget, Paul	451	Humphrey, Seth K.	125
Breese, Burtis Burr	234		
Bridie, Marion F.	126	Isaacs, Shachne	128
Bruce, H. Addington	127		
		Jastrow, Joseph	350
CAMPBELL, IVY G.	1	JOHNSON, ISABELLE	187
Carey, George W.	127	Jones, Edward Safford	353
Carrington, Hereward	351	Judd, Charles Hubbard	126
CASSEL, EDNA E.	129, 204		
CATTELL, JUDITH	333	KINCAID, MARGARET	227, 331
Chekhov, Anton	353		
COBB, MARGARET E.	331	Ladd, George Trumbull	234
Coe, George Albert	126	Leighton, Joseph Alexander	350
Coover, John Edgar	233	Lépine, Jean	126
Crosby, Elizabeth C.	235	Lintier, Paul	453
Cutolo, F., Jr.	442	Loisy, Alfred	451
		LUCKIESH, M.	182, 352
DALLENBACH, K. M.	122, 129, 204	Lyon, Darwin Oliver	353
DASHIELL, J. F.	435		
DE LASKI, E.	337	Macht, David I.	128
Dercum, Frances X.	127	Marden, Orison Swett	128
Downey, June E.	128, 236	Maude, A.	457
Drever, James	235	Maude, L.	457
		Maurras, Charles	452
Eder, M. D.	127	McComas, H. C.	128
Everett, Walter Goodnow	234	Minnick, John Harrison	235
		MONTAGUE, MARGARET	327
Freeman, Frank N.	126	MOORE, CLYDE B.	347
FRIEDLINE, CORA L.	400	Morel, Ferdinand	353
		Morgan, John J. B.	127
Gardner, Charles S.	351	MULFORD, HENRY JONES	272
Gemelli, Agostino	127	MYERS, GARRY C.	316

INDEX OF AUTHORS

Osborn, Henry Fairfield	124	Severn, Elizabeth	235
OTIS, MARGARET	291	Sharman, Henry Burton	125
Owen, F. E.	236	SMITH, HENRY BRADFORD	431
		Spaulding, Edward Gleason	455
Paschal, Franklin C.	353		
Paul, Emile	453	Terman, Lewis M.	352
Payson, Edwin B.	236	Thompson, Elizabeth Lock-	
PEPPER, STEPHEN C.	208	wood	127
Peterson, Joseph	127	TITCHENER, E. B. 219, 227, 337,	442
PHILIPS, ARTHUR S.	449	TOLMAN, EDWARD CHACE	187
Pintner, Rudolf	352, 353	Tolstoi, Leo	457
Poffenberger, A. T.	124	Toohey, John J.	457
		Towne, Charles Hanson	127
Restrepo-Hernandez, Julian	128		
REYNOLDS, M. M.	327	WALLIS, W. D.	66
RICH, GILBERT J.	120	WASHBURN, M. F. 327, 331, 333	
Rieber, Charles H.	353	WELD, H. P.	337, 442
Rogers, Agnes Low	353	WELLS, WESLEY RAYMOND 371, 383	
RUCKMICH, CHRISTIAN A.	214	WILLIAMS, H. D.	219
		Wilson, H. B.	353
Salter, William Mackintire	124	Winford, C. Amelia	353
SCHINZ, ALBERT	50, 393	Woodworth, Robert Sessions	352
Schnittkind, Henry T.	353		
SCHOEN, MAX	196	YOUNG, PAUL THOMAS 237, 420	

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VOL. XXIX

OCTOBER, 1918

No. 4

TABLE OF CONTENTS

ANNA BERLINER. The Influence of Mental Work on the Visual Memory Image.....	355
WESLEY RAYMOND WELLS. The Theory of Recapitulation and the Religious and Moral Discipline of Children.....	371
WESLEY RAYMOND WELLS. The Biological Value of Religious Belief.....	383
ALBERT SCHINZ. Intellectualism versus Intuitionism in French Philosophy since the War.....	393
CORA L. FRIEDLINE. The Discrimination of Cutaneous Patterns below the Two-Point Limen.....	400
P. T. YOUNG. The Localization of Feeling.....	420
HENRY BRADFORD SMITH. Aristotle's Other Logic.....	431
J. F. DASHIELL. Sixteen Origins of the Mind.....	435
MINOR STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF CORNELL UNIVERSITY. Communicated by E. B. TITCHENER, H. P. WELD and E. G. BORING	
XLIII. F. CUTOLO, JR. A Preliminary Study of the Psychology of Heat.....	442
ARTHUR S. PHELPS. The Mental Duet.....	449
BOOK REVIEWS.....	451
BOOK NOTES.....	455

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Through a mistake in the mailing room, a few untrimmed copies of the July JOURNAL were sent out to subscribers. The Publisher will be obliged by the return of these copies in exchange for trimmed copies (postage will be refunded).





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